

URBAN/MUNICIPAL
CA4 ON HBL 016
H18
1994

URBAN MUNICIPAL

OCT 18 1995

GOVERNMENT DOCUMENTS



1994 HAMILTON-WENTWORTH COLLISION REPORT

PREPARED BY:

**TRAFFIC
DEPARTMENT**

**City of
HAMILTON**

URBAN MUNICIPAL

OCT 18 1995

GOVERNMENT DOCUMENTS

1994 Hamilton-Wentworth Collision Report

Prepared For:

The Transportation/Environmental Services Department
of the Regional Municipality of Hamilton-Wentworth

The Hamilton-Wentworth Regional Police Department

By:

The City of Hamilton Public Works and Traffic Department

Project Manager:

H.L. Solomon, P. Eng.

ACKNOWLEDGEMENTS

The Project Staff of the Hamilton Public Works and Traffic Department wish to express their appreciation to the members of the Transportation/Environmental Services and Planning Departments of the Regional Municipality of Hamilton-Wentworth, the Regional Police Department and the Ministry of Transportation of Ontario for their co-operation and assistance in the preparation of this report.

The Project Staff was comprised of Mrs. Linda Juchniewicz, Mr. H. Solomon, Mr. Rob Galloway and Ms. Carmela Alletto of the Traffic Department. The Department wishes to thank Mr. Roland Salmon and the staff of the Services Division of the City Clerk's Department for their assistance in the preparation of this report.

1994 HAMILTON-WENTWORTH MOTOR VEHICLE COLLISION REPORT

Introduction

This annual report is a summary of factors associated with traffic collisions that occurred in the Regional Municipality of Hamilton-Wentworth in 1994.

The Regional Municipality of Hamilton-Wentworth is situated in southern Ontario, at the westerly end of Lake Ontario. The following Municipalities are located within the Region: The Town of Ancaster, The Town of Dundas, The Town of Flamborough, The Township of Glanbrook, The City of Hamilton and The City of Stoney Creek. The estimated total population of these combined localities was 459,656 in 1994.

Traffic collisions are a primary cause of accidental deaths, injuries and associated property losses. The intention of this report is to provide factual information to those agencies and persons concerned with the safety of the roadway transportation system within the Regional Municipality of Hamilton-Wentworth.

Traffic collisions frequently involve complex interactions between human behaviour, vehicle characteristics, and environmental conditions. The factor or factors responsible for causing a collision are not always the most obvious nor are they always readily apparent. Caution should be exercised in drawing conclusions from the statistics presented in this report and conclusions should be drawn only with appropriate qualifications and supportive information.

The information presented in this report is based primarily upon motor vehicle collisions investigated by the Hamilton-Wentworth Regional Police. All collisions occurring in Hamilton-Wentworth are included in the statistics in this report excluding collisions occurring on the Queen Elizabeth Way and Highway 403 and on-ramps and off-ramps to those highways. Collisions occurring on service roads to the Q.E.W. are included.

The main addition to the 1994 reports are statistical reviews of 2-way and all-way stop controlled intersections. These analyses are part of the collision countermeasure program underway in the City and Region.

EXECUTIVE SUMMARY

- * In 1994, 7,233 reported traffic collisions occurred on municipal roadways in the Regional Municipality of Hamilton-Wentworth. These collisions resulted in:
 - 8 driver or passenger fatalities (5 motor vehicle drivers, and 3 riders/passengers)
 - 2 cyclist fatalities
 - 3 pedestrian fatalities
 - 2,930 driver, cyclist or passenger injuries (not including fatalities)
 - 283 pedestrian injuries (not including fatalities)
 - 19,968 persons (equal to approximately 4 percent of the Regional population) being involved in a reported traffic collision
- * The overall frequency of collisions in Hamilton-Wentworth is generally lower than other major Canadian municipalities.
- * The frequency rate of fatalities in the City of Hamilton is lower than the average for other Canadian and U.S. cities of similar population.
- * The period from 1 a.m. to 5 a.m. exhibits the highest ratio of collisions to vehicle volume using the street system.
- * Drivers under the age of 35 years were involved in a disproportionate number of collisions relative to the age distribution of the licensed driving population of Ontario.
- * The predominant improper driver action indicated in collisions was "failed to yield right-of-way".
- * 5.0 percent of reported collisions involved one or more drivers who had been drinking.
- * Most collisions involving alcohol occurred in the evening from 6 p.m. to 3 a.m. These figures are indicative of alcohol being present in the bloodstream of one or more of the drivers involved in the collision and do not necessarily mean that alcohol was the proximate cause of the collision.
- * Pedestrians between the ages of 10 and 14 years of age were involved in a disproportionate number of collisions based on the age distribution of the population of Hamilton-Wentworth. Pedestrians in this age group were most frequently involved in a collision as the result of entering the roadway unexpectedly, coming from behind a parked vehicle, or running on to the roadway.

1994 COMPARED WITH PREVIOUS YEARS

1. Overall Collisions

441 fewer collisions occurred in 1994 than in 1993. While lower than 1993, the number was higher than the 1990 - 1992 period. The occurrence of injury collisions also decreased, by 108 injury collisions. **The number of fatal collisions in 1994 was the lowest in the past 3 decades and the number of injury collisions was also the lowest for the same time period.**

2. Bicycle Injuries

The number of people injured in motor vehicle collisions while riding on a bicycle increased by 2 from 1993 to 1994. When the years 1990 - 1993 were compared to the period 1986 - 1989, the number of cyclists injured appears to be declining. There were two cyclist fatalities in 1994.

3. Pedestrian Fatalities

In 1994, the number of pedestrian fatalities (3) was the lowest in 30 years.

4. Pedestrian Collisions Involving Five to Nine Year Olds

In 1994, 37 5-9 year old pedestrians were involved in collisions. In the years 1989 to 1991 the rate was 52/year on the average. For comparison, data for the years 1980 through 1983 were 90 collisions, 72 collisions, 107 collisions and 79 collisions respectively. In 1988 there were 75 collisions. The data for the years 1984 to 1987 is not available. The number of collisions involving five to nine year olds has generally declined over the past decade and appears to be at its lowest level.

5. Alcohol Involvement

Alcohol involvement in motor vehicle collisions has been, on average, steadily decreasing since 1978. In the years 1990 to present, alcohol involvement in collisions averaged 5.8 percent, compared to 10.3 percent for the previous 12 years. The rate of 5.0 percent in 1994 was the lowest recorded by this report (17 years).

6. Driver Action

In previous years, drivers in the 16-19 and 20-24 year old age groups were less likely than average to be found to be driving properly. In 1993 and 1994 both of these groups were substantially better than the norm for all drivers. Conversely, the 65-74 and 75+ age groups had poorer performance than in previous years.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1994 COMPARED WITH PREVIOUS YEARS

	<u>Page</u>
CHAPTER ONE - TRENDS	1
General	3
Normalizing The Data	3
Collisions	3
Injuries	4
Fatalities	4
Alcohol Involvement	5
CHAPTER TWO - SELECTED CHARACTERISTICS	15
Injuries	17
Time of Occurrence	17
Impact Type	18
CHAPTER THREE - DRIVERS	27
Driver Age	29
Drinking Drivers	29
Cyclists	29
CHAPTER FOUR - PEDESTRIANS	39
General	41
Age	41
Pedestrian Action	41
Time of Collision	41
Pedestrian Condition	42
Location	42
Driver Action	42
Pedestrian Injuries	42

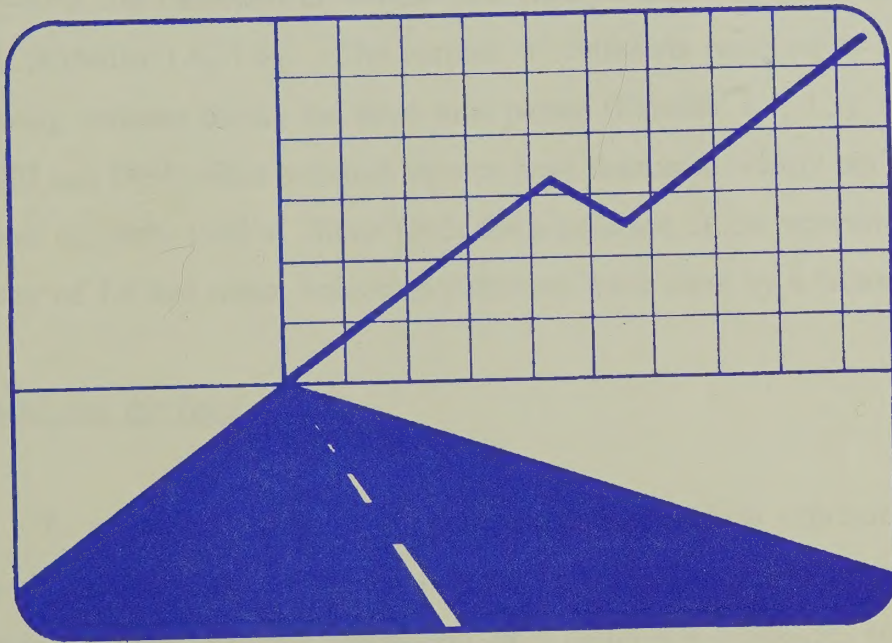
CHAPTER FIVE - ENVIRONMENT	55
Weather and Light Conditions	57
Road Surface	57
Pavement Marking	57
Road Characteristics	57
Road Location	58
Fixed Objects	58
 CHAPTER SIX - LOCATIONS	 67
General	69
Area Municipality	69
High Frequency Intersection Locations	69
Comparison of Hamilton and	70
Hamilton-Wentworth with Other Cities	

LIST OF EXHIBITS

EXHIBIT		PAGE
1.1	Motor Vehicle Collisions: History of Rates of Total Collisions and of Collisions Causing Injury/Fatality (1964-1994)	6
1.2	Personal Injuries/Fatalities: History of Injury and Fatality Rates Caused by Motor Vehicle Collisions (1964-1994)	7
1.3	Pedestrians Involved in Collisions: History of Injury and Fatality Rates (1964-1994)	8
1.4	Motor Vehicle Collision History (1964-1994)	9
1.5	History of Personal Injuries and Fatalities Caused by Motor Vehicle Collisions (1962-1994)	10
1.6	History of Pedestrian and Cyclist Injuries/Fatalities (1964-1994)	12
1.7	History of Alcohol-Related Motor Vehicle Collisions (1978-1994)	13
2.1	Injury Status of all Persons Involved	19
2.2	Time of Day vs Traffic Volume	20
2.3	Collision Occurrences vs Time of Day and Day of Week	21
2.4	Day of Week vs Collisions and Volume	22
2.5	Collisions vs Month of the Year	23
2.6	Initial Impact Type vs Class of Collision	24
2.7	Initial Impact Type vs Road Classification	25
2.8	Initial Impact Type vs Type of Traffic Control	26
3.1	Motor Vehicle Driver Age vs Collision Involvement	30
3.2	Motor Vehicle Driver Age vs Driver Action	31
3.3	Alcohol Involvement vs Collision Classification	32

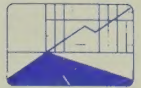
3.4	Collisions Involving Alcohol vs Time of Day and Day of Week	33
3.5	Driver Action vs Driver Condition	34
3.6	Driver Age vs Driver Condition	36
3.7	Cyclist Actions in Motor Vehicle Collisions: Percentage Riding Properly vs Age Group	37
4.1	Pedestrian Age vs Collision Involvement	43
4.2	Pedestrian Age vs Pedestrian Action (All Locations)	44
4.3	Pedestrian Age vs Pedestrian Action (At Traffic Signals)	46
4.4	Time of Day vs Number of Pedestrians Injured	48
4.5	Time of Day vs Pedestrian Age	49
4.6	Condition of Pedestrians Involved in collisions	50
4.7	Type of Traffic Control at Locations Where Pedestrian Collisions Occurred	51
4.8	Driver Action in Pedestrian Collisions	52
4.9	Pedestrian Age vs Injury Status	53
5.1	Weather and Light Conditions in Motor Vehicle Collisions	59
5.2	Road Surface Conditions in Motor Vehicle Collisions	60
5.3	Pavement Markings in Motor Vehicle Collisions	61
5.4	Road Alignment (Non-Intersection and Intersection) in Motor Vehicle Collisions	62
5.5	Road Characteristics (Non-Intersection and Intersection) in Motor Vehicle Collisions	63
5.6	Location of Collisions	64
5.7	Types of Fixed Objects Struck in Motor Vehicle Collisions	65

6.1	Collisions vs Area Municipality	71
6.2	Intersections with the Highest Number of Collisions in 1994	72
6.3	Signalized Intersections With the Highest Collisions Rates in 1994	74
6.4	Two-way Stop Intersections with the Highest Collision Rates, 1990-1994	77
6.5	All-way Stop Intersections with the Highest Collision Rates, 1990-1994	80
6.6	Urban Road Sections with the Highest Collision Rates, 1990-1994 City of Hamilton Arterials, All Intersections Included	82
6.7	Urban Road Sections with the Highest Collision Rates, 1990-1994 City of Hamilton Arterials, Signalized Intersections not Included	83
6.8	Urban Road Sections with the Highest Collision Rates, 1990-1994 City of Hamilton Arterials, Intersections not Included	84
6.9	1994 Collision Statistics - Selected Canadian Cities	86
6.10	Fatal Collision Statistics	90



Chapter One

Trends



Chapter 1

General

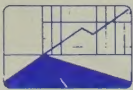
Since peaking in 1965 the overall number of motor vehicle collisions, and the number of pedestrians injured in motor vehicle collisions in the Regional Municipality of Hamilton-Wentworth has exhibited an overall decreasing trend, with minor peaks around 1977 and 1988, (Exhibits 1.4, 1.6). The number of collisions resulting in a fatality has remained relatively constant during the same time period (Exhibits 1.4, 1.5), with a notable decrease in 1993 and 1994, while personal injuries have fluctuated widely but are presently below the level of the early 1960's. Since 1965, the population of the reporting area has increased by a factor of 1.6 and motor vehicle registrations have risen by a factor of 3.

Normalizing the Data

To assess historical trends, collision data should be expressed as a normalized rate through the use of one of several factors. Information on annual motor vehicle use would provide the most accurate assessment of a motorist's exposure, and hence, likelihood of involvement in a collision. Motor vehicle registration data is somewhat less accurate as a normalizing factor, but is utilized since exposure information is not available. Population also provides a suitable and accurate normalizing factor. Exhibits 1.1, 1.2, 1.3 and associated analysis in this chapter refer to data which has been calculated on a population *rate* basis (based on 1991 population data).

Collisions

The overall motor vehicle collision rate is shown in Exhibit 1.1. As of January 1, 1978, the reporting level for property damage only collisions was raised from \$200.00 to \$400.00. In January 1, 1985, it was raised again from \$400.00 to \$700.00. Due to these changes, trend analysis cannot be conducted on property damage collisions (Exhibit 1.4). The rate for total collisions appears to show a decline from 1977 to 1992. 1993 shows the first significant increase in five years, while 1994 again exhibits a decrease. However, due to the changes in the reporting



criteria and reporting area (this reporting area increased in 1974) for the period for which historical data are available, trend analysis on the number of collisions would not be appropriate or meaningful.

The rate of collisions involving injury or fatality shows a modest decline from 1973 to 1989 and a more substantial decline from 1989 to present (Exhibit 1.1). Individual trends of injuries and fatalities are discussed below.

Injuries

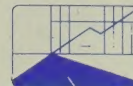
The rate of personal injury (Exhibits 1.2, 1.5) is rather volatile. However since 1989, the rate of personal injuries has been on the decline and the frequency of personal injury occurrence in 1994 is the lowest it has been during the period since 1964. The rate for pedestrian injuries (Exhibits 1.3, 1.6) shows a significant and continuing decline from 1966 to 1994, and is at an all-time low for the period for which records have been kept.

Fatalities

In 1994, thirteen persons died in motor vehicle collisions in Hamilton-Wentworth. This is the lowest number in the record keeping period of 30 years.

Fatal collisions are rare events and small changes in the number of fatalities cause large fluctuations in the fatality rate (Exhibit 1.2, 1.4). These fluctuations reduce the validity of statistical tests. Thus while the fatality rate for personal fatalities shows a slight downward trend, especially since 1978, this trend is not statistically significant.

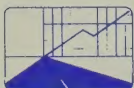
In 1994, three pedestrians died in motor vehicle collisions. This also is the lowest number in the record keeping period (3 deaths also occurred in 1985). The fatality rate for pedestrians (Exhibit 1.3, 1.6) displays a significant reduction, especially since 1978.



Alcohol Involvement

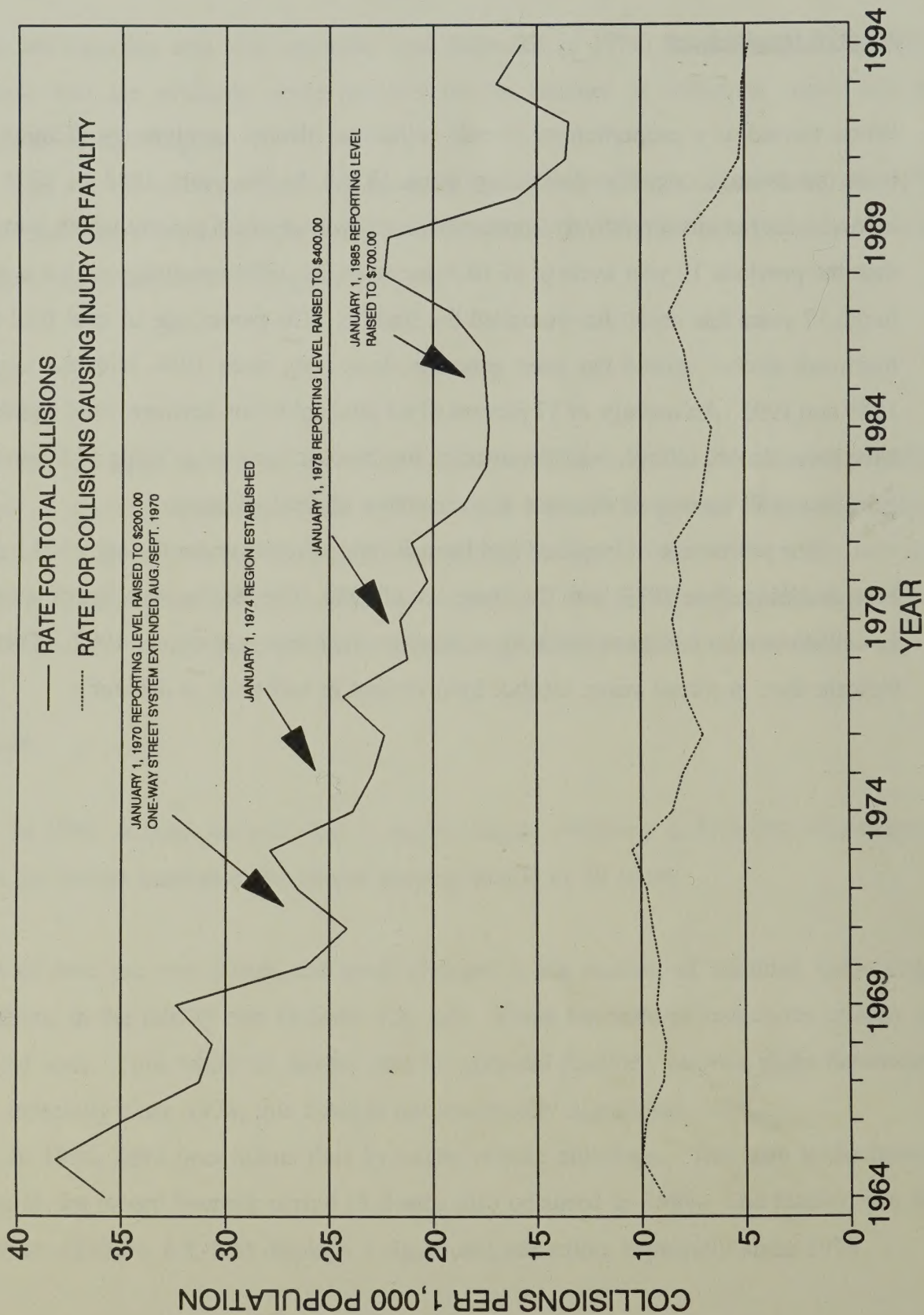
When viewed as a proportion of overall collisions, alcohol involvement (Exhibit 1.7) has been, on average, steadily decreasing since 1978. In the years 1988 to 1994 collision involvement remained relatively constant with an average of 5.8 percent which is much lower than the previous 12 year average of 10.3 percent. The 1994 percentage of 5.0 is the lowest in the 17 years this report has compiled the statistic. The percentage of total fatal collisions that were alcohol related has been generally decreasing since 1984, with the exception of 1989 and 1993. An average of 17 percent of all fatal collisions between 1984 and the present have been alcohol related, with the average for the past three years being 14.0 percent. This coincides with an overall decrease in the number of fatal collisions.

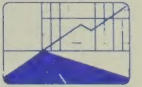
The percentage of impaired/had been drinking drivers under the age of 21 has steadily been declining since 1979, with the exception of 1986. The 1994 percentage of young drivers in collisions who had been drinking was lower than any year except 1992. These figures indicate that, in recent years, alcohol involvement in collisions is declining.



MOTOR VEHICLE COLLISIONS: HISTORY OF RATES OF TOTAL COLLISIONS & COLLISIONS CAUSING INJURY/FATALITY

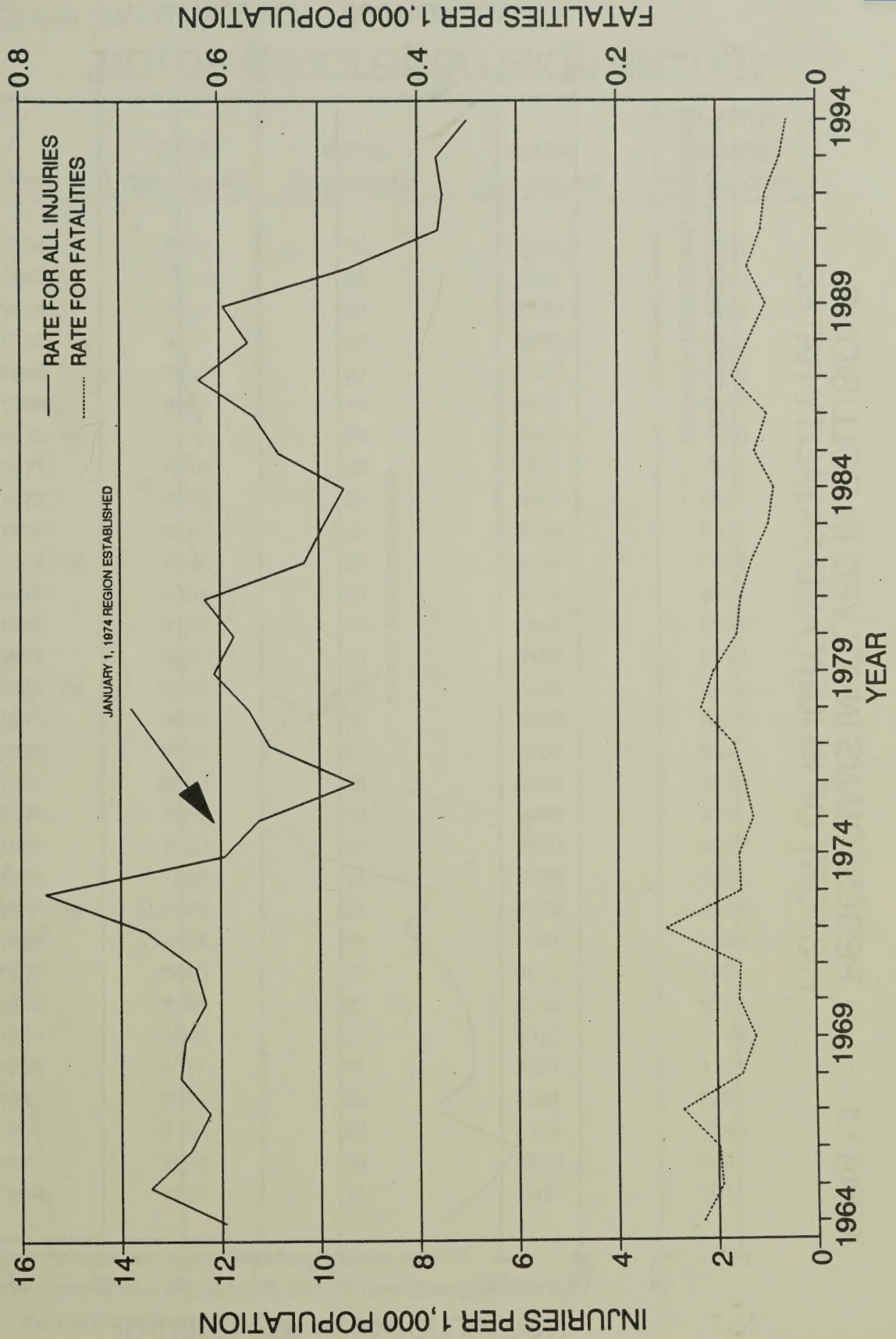
Exhibit 1.1





PERSONAL INJURIES/FATALITIES: HISTORY OF INJURY AND FATALITY RATES CAUSED BY MOTOR VEHICLE COLLISIONS

Exhibit 1.2



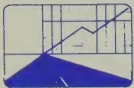
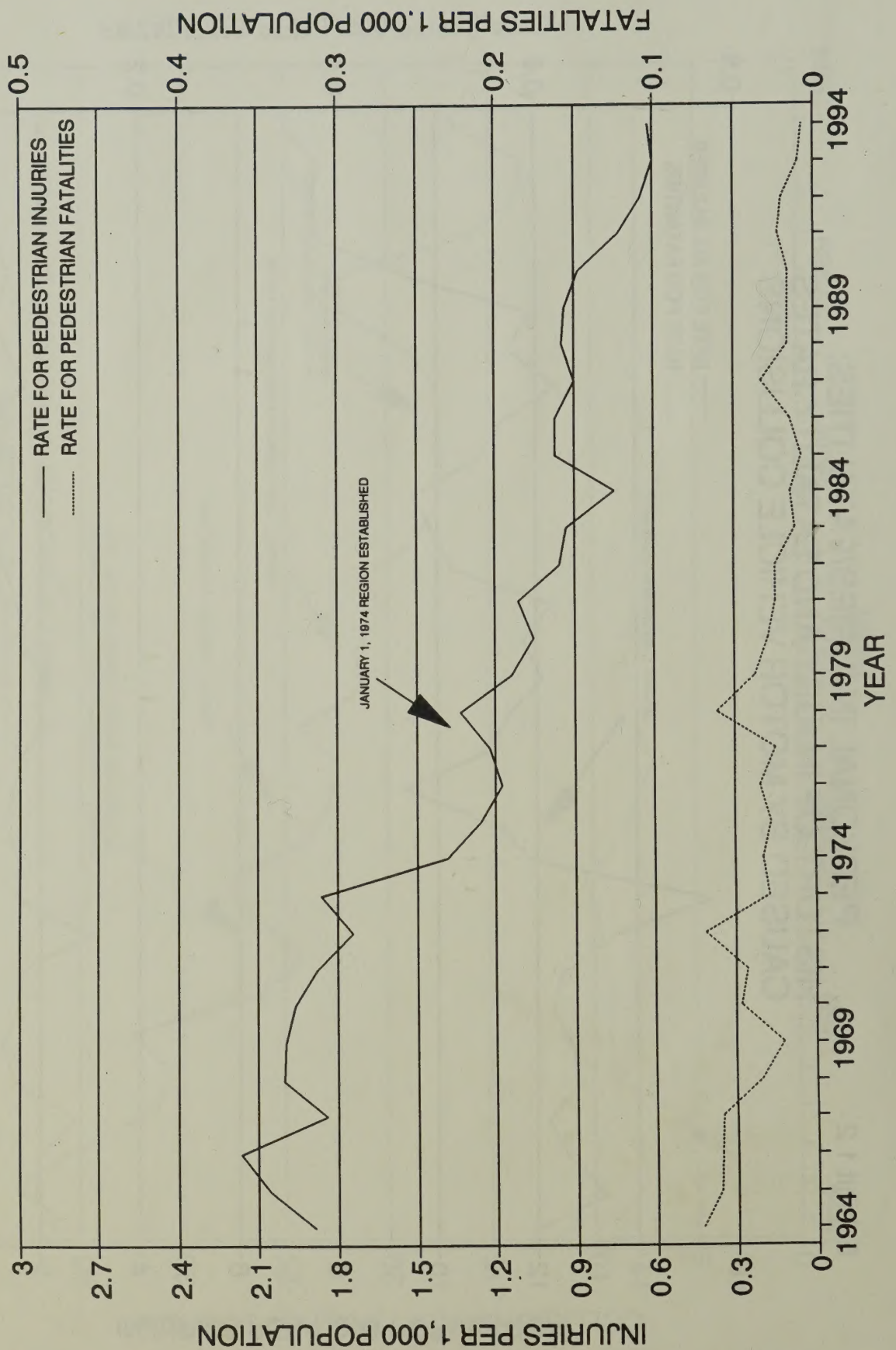


Exhibit 1.3 PEDESTRIANS INVOLVED IN COLLISIONS: HISTORY OF INJURY AND FATALITY RATES



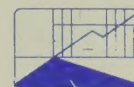


Exhibit 1.4

MOTOR VEHICLE COLLISION HISTORY

YEAR	TOTAL COLLISIONS	FATAL COLLISIONS	INJURY COLLISIONS	PROPERTY DAMAGE COLLISIONS
1964	9948	32	2455	7461
1965	10783	26	2789	7968
1966	9950	27	2757	7166
1967	9106	35	2575	6496
1968	8983	21	2547	6415
1969	9589	19	2721	6849
1970 (a)	7799	23	2676	5100
1971	7314	22	2821	4471
1972	8065	39	2901	5125
1973	8499	23	3143	5333
1974 (b)	9599	29	3364	6206
1975	9354	24	3219	6111
1976	9146	28	2816	6302
1977	10011	33	3182	6796
1978 (a)	8636	45	3246	5345
1979	8798	39	3389	5370
1980	9305	33	3253	5019
1981	8660	28	3398	5234
1982	7663	23	2939	4701
1983	7268	20	2839	4409
1984	7228	18	2726	4484
1985 (a)	7346	21	3153	4172
1986	7434	21	3331	4082
1987	8140	35	3615	4491
1988	9586	22	3285	6279
1989	9566	21	3372	6173
1990	6917	25	2751	4141
1991	6145	25	2331	3789
1992	6180	22	2312	3846
1993	7674	15	2313	5346
1994	7233	13	2205	5015

(a) Collision reporting criteria changed (see page 3).

(b) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

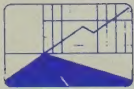
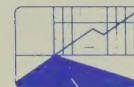


Exhibit 1.5

HISTORY OF PERSONAL INJURIES AND FATALITIES CAUSED BY MOTOR VEHICLE COLLISIONS

YEAR	TOTAL COLLISIONS	PERSONS INJURED	PERSONAL INJURIES/1,000 POPULATION		NUMBER OF FATALITIES	FATALITIES/ 100,000 POPULATION		FATALITIES/ 10,000 REGISTERED VEHICLES	
			POPULATION	INJURIES/1,000 POPULATION		POPULATION	FATALITIES/ 100,000 POPULATION	REGISTERED VEHICLES	FATALITIES/ 10,000 REGISTERED VEHICLES
1962	8338	2542	9.5	11.9	32	11.9	3.82		
1963	9554	3075	11.6	10.2	27	10.2	3.03		
1964	9948	3305	11.9	11.5	32	11.5	3.43		
1965	10783	3824	13.4	9.5	27	9.5	2.64		
1966	9950	3746	12.6	9.8	28	9.8	2.60		
1967	9106	3484	12.2	13.7	39	13.7	3.63		
1968	8983	3573	12.8	7.9	22	7.9	1.89		
1969	9589	3768	12.7	6.4	19	6.4	1.64		
1970 (a)	7799	3717	12.3	7.5	23	7.5	2.00		
1971	7314	3876	12.5	7.0	23	7.0	1.91		
1972	8065	4055	13.5	15.3	46	15.3	3.42 (b)		
1973	8499	4951	15.5	7.2	23	7.2	1.63		
1974 (c)	9599	4678	11.9	7.9	31	7.9	2.00 (b)		
1975	9354	4474	11.2	6.5	26	6.5	1.60 (b)		
1976	9146	3811	9.3	7.1	29	7.1	1.78 (b)		
1977	10011	4513	11.0	8.3	34	8.3	2.00 (b)		
1978 (a)	8636	4635	11.4	11.6	47	11.6	2.06 (d)		
1979	8798	4923	12.1	10.3	42	10.3	2.20 (d)		
1980	8305	4800	11.7	8.0	33	8.0	1.43 (d)		
1981	8660	5015	12.3	7.6	31	7.6	1.12 (d)		
1982	7663	4175	10.3	6.6	27	6.6	0.91		
1983	7268	4041	9.9	4.9	20	4.9	1.05 (e)		



1984	7228	3855	9.5	18	3.8	0.83 (e)
1985 (a)	7346	4529	10.8	26	6.2	1.16 (e)
1986	7434	4758	11.3	21	5.0	0.90 (e)
1987	8140	5220	12.4	36	8.4	1.50 (e)
1988	9586	4898	11.4	29	6.8	1.17 (e)
1989	9566	5145	11.9	22	5.1	0.87 (e)
1990	6917	4053	9.4	30	6.9	1.18 (e)
1991	6145	3420	7.6	25	5.5	0.96 (d)
1992	6180	3439	7.5	23	5.0	0.75 (e)
1993	7674	3421	7.6	16	3.5	0.51 (e)
1994	7233	3213	7.4	13	3	0.41 (e)

(a) Collision reporting criteria changed (see page 3).

(b) Registration estimated from total Ontario registrations.

(c) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

(d) Registration data from licence information.

(e) Registration data from licence information for Wentworth County.

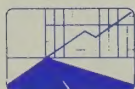


Exhibit 1.6

HISTORY OF PEDESTRIAN AND CYCLIST INJURIES AND FATALITIES

YEAR	COLLISIONS INVOLVING PEDESTRIANS	PEDESTRIANS INJURED	PEDESTRIAN FATALITIES	COLLISIONS INVOLVING CYCLISTS	CYCLISTS INJURED	CYCLIST FATALITIES
	(c)	(a)		(c)	(a)	
1964		526	20		120	0
1965		582	17		140	0
1966		618	17		132	1
1967		537	17		113	0
1968		588	10		84	1
1969		602	6		91	2
1970		586	14		101	1
1971		570	13		155	2
1972		530	21		156	2
1973		569	9		197	1
1974 (b)		555	13		192	3
1975		513	11		235	0
1976		480	14		195	0
1977		503	10		193	3
1978		542	25		162	1
1979		464	15		177	4
1980		434	12		178	1
1981		458	10		159	1
1982		396	10		252	2
1983		387	5		200	2
1984		314	6		175	1
1985		410	3		239	2
1986	384	412	6	229	228	2
1987	379	383	14	244	244	2
1988	401	406	7	239	225	0
1989	411	403	7	164	154	3
1990	381	383	7	208	195	0
1991	332	330	10	193	185	3
1992	300	297	9	219	209	3
1993	299	291	4	201	183	0
1994	290	283	3	196	185	2

(a) One or more pedestrian\cyclist could be involved and a fatality\injury may not have occurred.

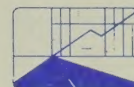
(b) Prior to this year, reporting was for the City of Hamilton only.

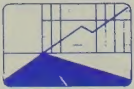
(c) This information was not available until 1986.

HISTORY OF ALCOHOL-RELATED MOTOR VEHICLE COLLISIONS

YEAR	TOTAL REPORTED COLLISIONS	TOTAL ALCOHOL- RELATED COLLISIONS (a)	% IMPAIRED OR PERCENTAGE HAD BEEN OF TOTAL COLLISIONS INVOLVING		ALCOHOL AGE OF 21	TOTAL FATAL COLLISIONS	ALCOHOL- RELATED FATAL COLLISIONS (a)	% FATAL COLLISIONS HAVING ALCOHOL INVOLVED	
			COLLISIONS	DRIVERS UNDER THE					
1978	8636	1128	13.1	22.1	22.1	45	11	24.4	
1979	8798	1139	12.9	22.1	22.1	39	5	12.8	
1980	8305	929	11.2	18.7	18.7	33	11	33.3	
1981	8660	1053	12.2	16.4	16.4	28	8	28.6	
1982	7663	895	11.7	19.0	19.0	23	3	13.0	
1983	7268	765	10.5	18.6	18.6	20	5	25.0	
1984	7228	729	10.1	15.0	15.0	18	5	27.8	
1985	7346	644	8.8	12.7	12.7	21	5	23.8	
1986	7434	596	8.0	20.5	20.5	21	4	19.0	
1987	8140	589	7.2	11.9	11.9	35	5	14.3	
1988	9586	582	6.1	9.9	9.9	22	2	9.1	
1989	9566	542	5.7	6.7	6.7	21	6	28.6	
1990	6917	430	6.2	6.6	6.6	25	4	16.0	
1991	6145	385	6.3	7.6	7.6	25	3	12.0	
1992	6180	398	6.4	2.1	2.1	22	0	0.0	
1993	7674	397	5.1	5.5	5.5	15	4	26.7	
1994	7233	359	5.0	4.7	4.7	13	2	15.4	

(a) Includes drivers classified as impaired due to alcohol or classified as having been drinking (refer to Exhibit 3.5 for a more detailed description of categories).





1994 Hamilton-Wentworth Collision Report

Chapter 4: Analysis of Collision Data

4.1 Introduction

4.2 Data Sources

4.3 Data Analysis

4.4 Results

4.5 Conclusions

4.6 Recommendations

4.7 Appendix

4.8 References

4.9 Figures

4.10 Tables

4.11 Glossary

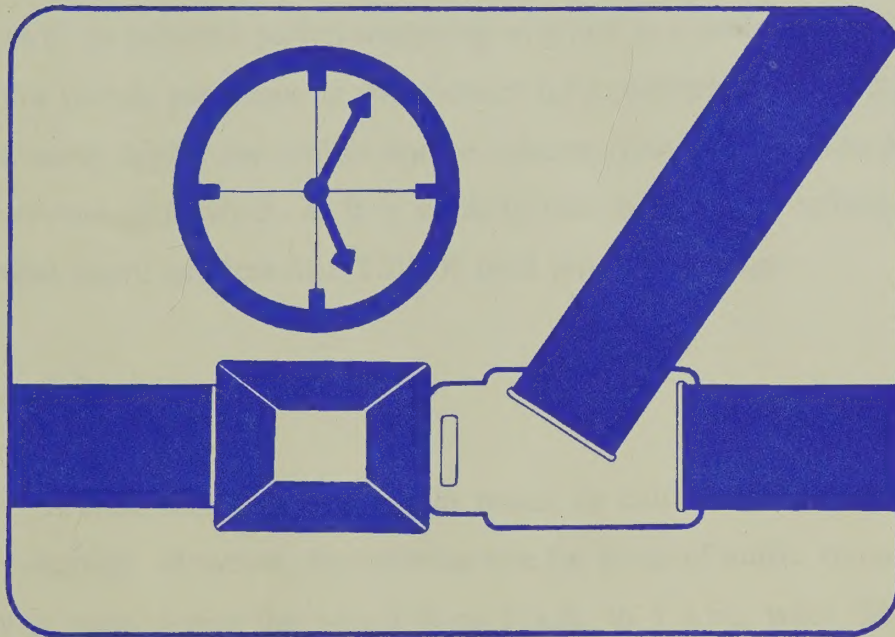
4.12 Acronyms

4.13 Abbreviations

4.14 Symbols

4.15 Units

4.16 Notes



Chapter Two

Selected Characteristics



Chapter 2

Injuries

Of the 19,968 persons involved in collisions, in 1994, 3,226 received injuries. The chance of an involved person sustaining an injury in a collision varied from 13.6 percent for a motor vehicle passenger, to 94.7 percent for a pedestrian. The risk of injury appears to be significantly higher for cyclists and pedestrians (Exhibit 2.1). The percentages are high for cyclists and pedestrians, as it is unlikely that this type of collision could occur with no personal injury and less than \$700.00 total property damage.

Time of Occurrence

A close similarity between the trends for collisions and traffic volumes (Exhibit 2.2) was observed. However, the collision rate (in terms of traffic volume) was greater than the daily average during the period from 1 a.m. to 5 a.m., when 382 or 5.3 percent of all collisions occurred. This may be due to driver conditions such as fatigue or alcohol impairment (refer to Exhibit 3.4 which shows that most collisions involving alcohol occurred in the evening).

The pattern of collision occurrences by time of day and day of week was summarized, and the differences found in the pattern of collision occurrence reflected traffic volumes. The highest number of collisions (1167) occurred between the hours of 3 p.m. to 5 p.m. (Exhibit 2.3) with the highest percentage of collisions occurring Wednesdays, Thursdays and Fridays (Exhibit 2.4).

The pattern of collision occurrences was compared on a month of year basis (Exhibit 2.5) and there was a difference in the number of collisions which occurred each month. The higher number of collisions occurred during January and February. This is likely due to drivers not adjusting for road conditions during a more severe than usual winter.



Impact Type

The type of initial impact was compared with the injury classification of the collisions (Exhibit 2.6). The probability of an injury or fatality resulting from a collision was highest in "head on" (48.3%) and "pedestrian/vehicle" (94.7%) collision types. However, these collision types only make up 6.3 percent of the total collisions. The majority of collisions were either "rear end" (1706) or "right angle" (1267) in nature.

Greater than one half of all collisions were associated with intersections (Exhibit 2.7). 30.9 percent of collisions occurred at or near signalized intersections and 26.1 percent occurred at or near intersections with stop or yield control (Exhibit 2.8). Forty-two percent of all collisions occurred at locations with no form of traffic control.



Exhibit 2.1

INJURY STATUS OF ALL PERSONS INVOLVED

DESCRIPTION OF PERSONS INVOLVED	PERSONS INVOLVED	PERSONAL INJURIES & FATALITIES	% OF PERSONS INJURED/ PERSONS INVOLVED	TYPE OF INJURY*			
				FATAL	MAJOR	MINOR	MINIMAL
DRIVER	12311	1784	14.5%	5	57	691	1031
CYCLIST	207	187	90.3%	2	10	78	97
PASSENGER	7148	969	13.6%	3	38	345	583
PEDESTRIAN	302	286	94.7%	3	35	145	103
TOTAL	19968	3226	16.2%	13	140	1259	1814

SELECTED
CHARACTERISTICS

FOR APPROXIMATELY EVERY 22 RESIDENTS OF THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH, 1 PERSON WAS INVOLVED IN A MOTOR VEHICLE COLLISION IN 1994.

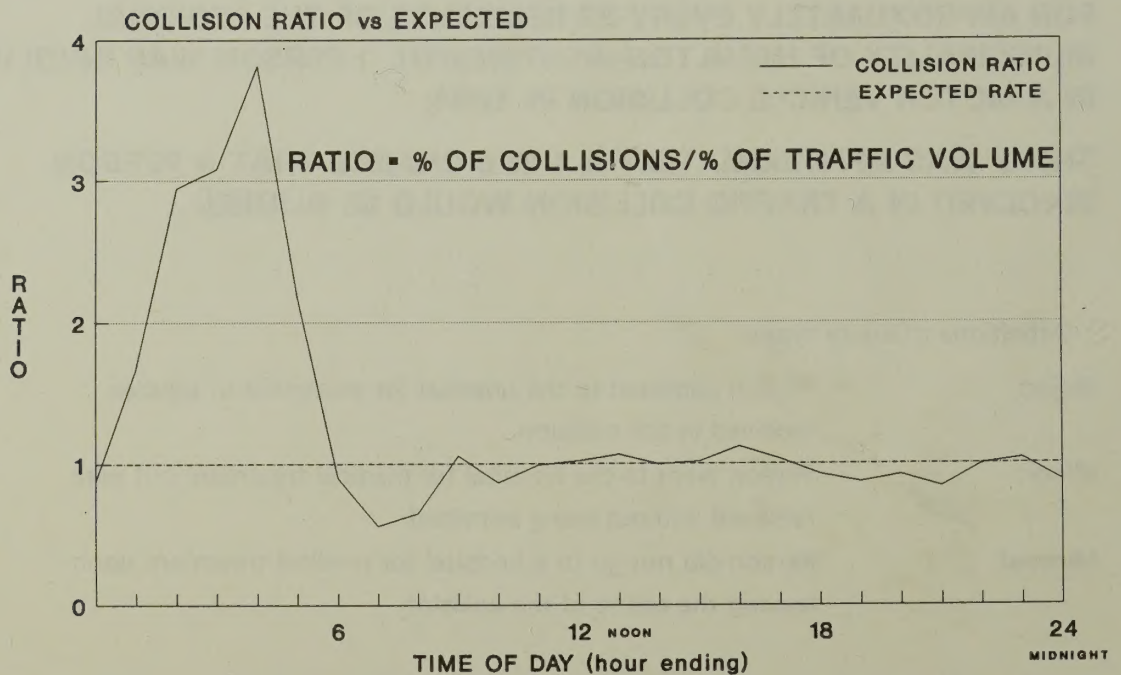
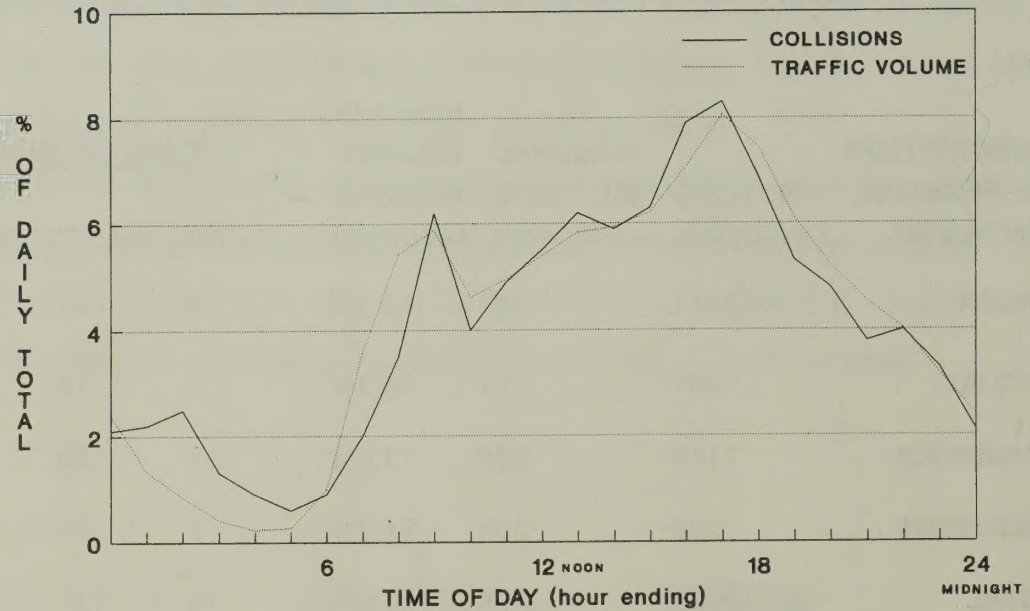
THERE WAS APPROXIMATELY A 1 IN 6 CHANCE THAT A PERSON INVOLVED IN A TRAFFIC COLLISION WOULD BE INJURED.

* Definitions of injury types:

- Major: Person admitted to the hospital for treatment of injuries received in the collision.
- Minor: Person went to the hospital for medical treatment but was released without being admitted.
- Minimal: Person did not go to a hospital for medical treatment upon leaving the scene of the collision.



Exhibit 2.2 TIME OF DAY vs TRAFFIC VOLUME



COLLISIONS OCCURRED AT A MUCH HIGHER THAN EXPECTED RATE (RELATIVE TO TRAFFIC VOLUME) BETWEEN 1 A.M. AND 5 A.M. DAILY



Exhibit 2.3

COLLISION OCCURENCES BY TIME OF
DAY AND DAY OF WEEK

TIME OF DAY	DAY OF WEEK							DAILY TOTAL	%
	MON.	TUES.	WED.	THURS.	FRI.	SAT.	SUN.		
12-1 a.m.	17	12	20	16	17	45	32	159	2.2%
1-2 a.m.	9	12	16	13	18	60	54	182	2.5%
2-3 a.m.	6	7	5	9	16	24	24	91	1.3%
3-4 a.m.	7	6	3	6	8	17	17	64	0.9%
4-5 a.m.	3	5	6	4	4	10	13	45	0.6%
5-6 a.m.	9	10	9	11	10	5	13	67	0.9%
6-7 a.m.	19	25	34	30	17	13	6	144	2.0%
7-8 a.m.	39	34	64	50	45	10	11	253	3.5%
8-9 a.m.	80	66	110	91	68	21	10	446	6.2%
9-10 a.m.	47	40	68	47	41	40	9	292	4.0%
10-11 a.m.	52	58	62	66	55	43	22	358	4.9%
11-12 NOON	53	57	58	66	57	77	30	398	5.5%
12-1 p.m.	58	67	65	69	66	67	53	445	6.2%
1-2 p.m.	48	42	73	57	74	65	66	425	5.9%
2-3 p.m.	64	79	57	69	80	63	42	454	6.3%
3-4 p.m.	78	101	83	80	90	79	57	568	7.9%
4-5 p.m.	79	88	101	111	86	90	44	599	8.3%
5-6 p.m.	66	75	70	81	93	71	44	500	6.9%
6-7 p.m.	48	68	62	66	60	50	30	384	5.3%
7-8 p.m.	38	52	52	59	58	44	43	346	4.8%
8-9 p.m.	44	34	47	28	44	38	38	273	3.8%
9-10 p.m.	33	41	36	47	47	56	31	291	4.0%
10-11 p.m.	23	27	26	27	56	46	33	238	3.3%
11-12 MIDNIGHT	9	15	26	25	30	29	19	153	2.1%
UNKNOWN	6	6	7	7	10	12	10	58	0.8%
WEEKLY TOTAL	935	1027	1160	1135	1150	1075	751	7233	100%

COLLISIONS WERE MOST LIKELY TO OCCUR BETWEEN
4 p.m. and 5 p.m. ON WEDNESDAYS AND THURSDAYS.

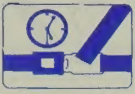
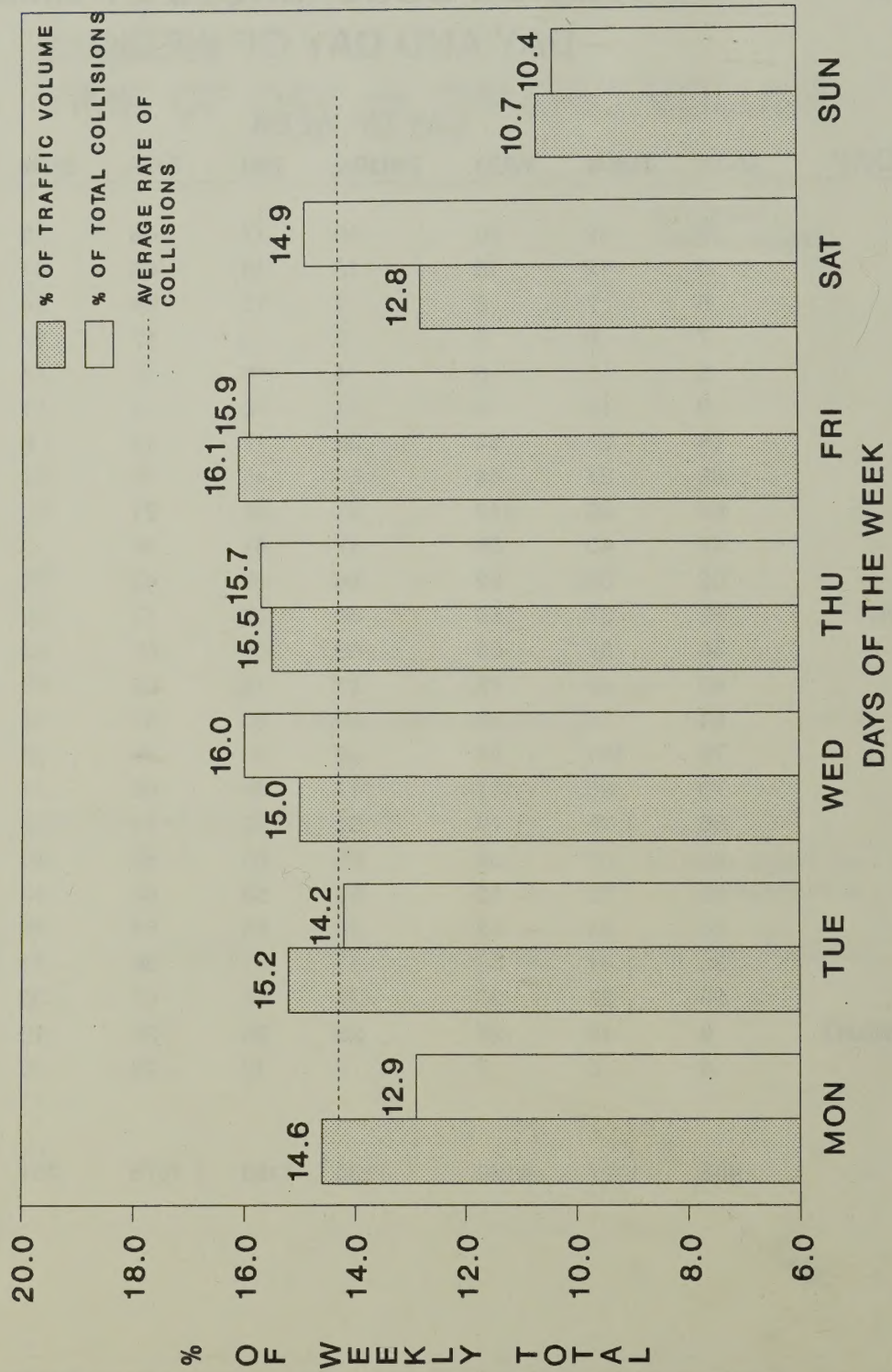


Exhibit 2.4

DAY OF WEEK vs COLLISIONS AND VOLUME

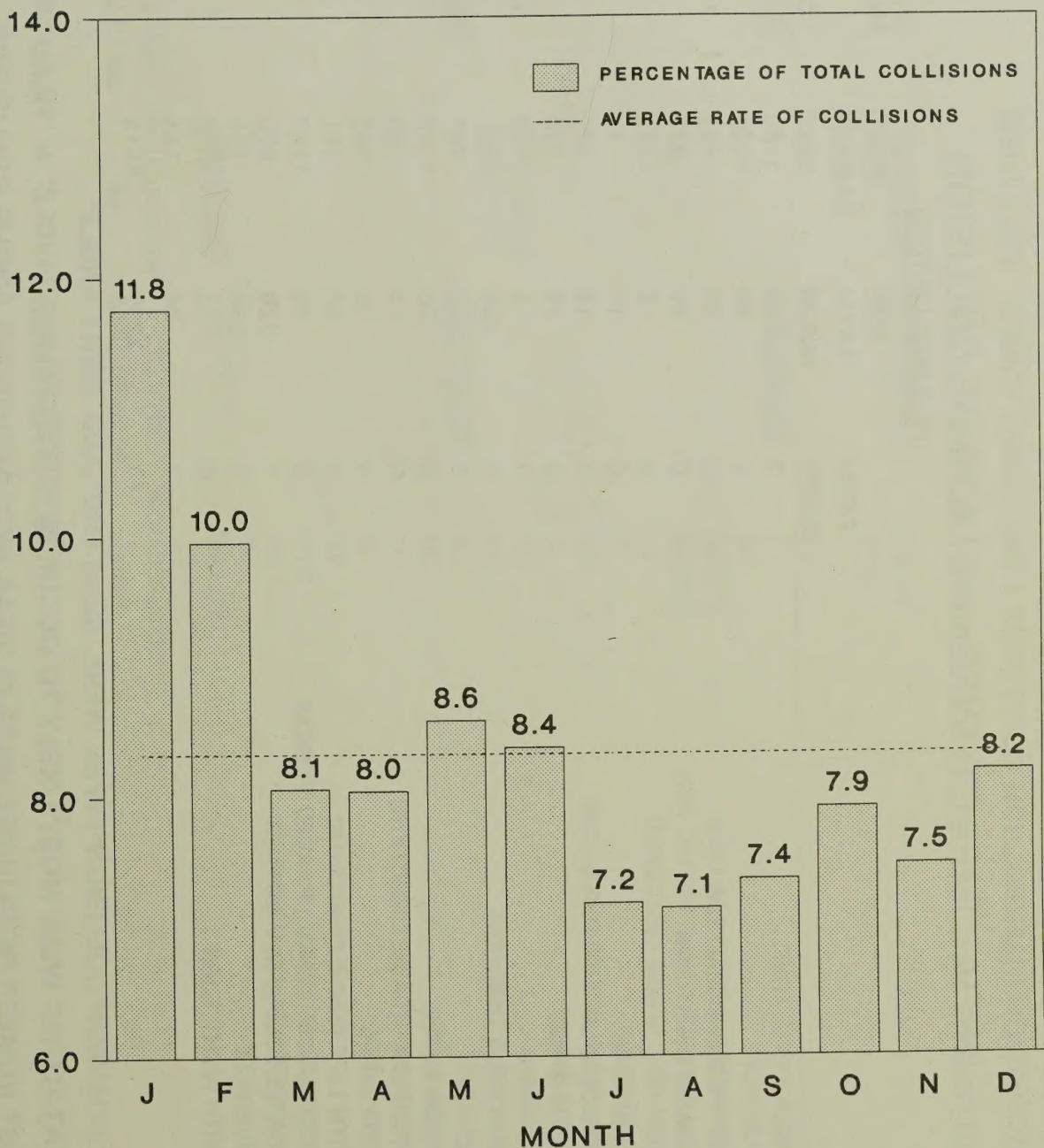


WEDNESDAYS, THURSDAYS AND SATURDAYS HAD MORE COLLISIONS THAN EXPECTED WHEN COMPARED TO TRAFFIC VOLUME. THE HIGHEST NUMBER OF COLLISIONS OCCURRED ON WEDNESDAYS.



Exhibit 2.5

COLLISIONS vs MONTH OF THE YEAR



THE HIGHEST PERCENTAGE OF COLLISIONS OCCURRED IN THE MONTHS OF JANUARY AND FEBRUARY.



Exhibit 2.6

INITIAL IMPACT TYPE vs CLASS OF COLLISION

INITIAL IMPACT TYPE (a)	CLASSIFICATION				PROP. DAMAGE ONLY	ALL TYPES OF COLLISIONS	% OF TYPE	
	FATAL INJURY	NON- FATAL INJURY		INVOLVING INJURY/ FATALITY				
REAR END	2	599		1105	1706	35.2%		
HEAD ON	4	80		90	174	48.3%		
SIDE SWIPE (OPPOSITE DIRECTION)	0	20		82	102	19.6%		
SIDE SWIPE (SAME DIRECTION)	0	85		447	532	16.0%		
OVERTAKING	0	12		72	84	14.3%		
RIGHT TURN REAREND	0	17		73	90	18.9%		
RIGHT TURN ONCOMING	0	15		42	57	26.3%		
LEFT TURN ONCOMING	0	78		214	292	26.7%		
LEFT TURN REAREND	0	12		79	91	13.2%		
LEFT TURN OPPOSING THROUGH	2	204		381	587	35.1%		
RIGHT ANGLE	1	485		781	1267	38.4%		
RIGHT TURN SIDE SWIPE	0	0		5	5	0.0%		
THROUGH WITH RIGHT (SAME DIRECTION)	0	17		60	77	22.1%		
LEFT TURN SIDE SWIPE	0	0		12	12	0.0%		
THROUGH WITH LEFT (SAME DIRECTION)	0	37		171	208	17.8%		
SINGLE MOTOR VEHICLE (S.M.V.)/PARKED VEHICLE	0	35		567	602	5.8%		
SINGLE MOTOR VEHICLE (S.M.V.)/OTHER	1	220		670	891	24.8%		
PEDESTRIAN/VEHICLE	2	264		15	281	94.7%		
LEFT TURN WITH RIGHT TURN	0	1		8	9	11.1%		
OTHER	1	24		141	166	15.1%		
TOTAL	13	2205		5015	7233			

THE MOST COMMON COLLISION TYPES WERE 'REAR END' AND 'RIGHT ANGLE'.

INJURIES/FATALITIES WERE MOST LIKELY TO OCCUR IN "PEDESTRIAN/VEHICLE" & "HEAD ON" COLLISIONS.

THE HIGHEST NUMBER OF INJURIES WERE IN 'REAR END' AND 'RIGHT ANGLE' COLLISIONS.

(a) The traffic movements causing these collisions are shown diagrammatically on the chart in Appendix A.1.

Exhibit 2.7

INITIAL IMPACT TYPE vs ROAD CLASSIFICATION

ROAD LOCATION

INITIAL IMPACT TYPE	NON- INTERSECTION	INTERSECTION RELATED	IN INTERSECTION	AT		OTHER (a)	TOTAL
				PRIVATE	DRIVE		
REAR END	715	382	467	119		23	1706
HEAD ON	136	9	18	9		2	174
SIDE SWIPE (OPPOSITE DIRECTION)	74	8	13	5		2	102
SIDE SWIPE (SAME DIRECTION)	312	78	117	23		2	532
OVERTAKING	43	14	15	11		1	84
RIGHT TURN REAREND	8	23	41	18		0	90
RIGHT TURN ONCOMING	10	11	31	5		0	57
LEFT TURN ONCOMING	26	29	135	101		1	292
LEFT TURN REAREND	9	20	47	15		0	91
LEFT TURN OPPOSING THROUGH	32	66	416	72		1	587
RIGHT ANGLE	75	173	898	117		4	1267
RIGHT TURN SIDE SWIPE	0	2	3	0		0	5
THROUGH WITH RIGHT (SAME DIRECTION)	14	9	29	25		0	77
LEFT TURN SIDE SWIPE	0	2	9	1		0	12
THROUGH WITH LEFT (SAME DIRECTION)	32	19	124	33		0	208
SINGLE MOTOR VEHICLE (S.M.V.)/PARK. VEH.	458	32	38	68		6	602
SINGLE MOTOR VEHICLE (S.M.V.)/OTHER	549	80	157	56		49	891
PEDESTRIAN/VEHICLE	99	31	129	19		3	281
LEFT TURN WITH RIGHT TURN	3	1	5	0		0	9
OTHER (a)	51	15	34	65		1	166
TOTAL	2646	1004	2726	762		95	7233
%	36.6%	13.9%	37.7%	10.5%		1.3%	100.0%

51% OF COLLISIONS WERE IN, OR ASSOCIATED WITH INTERSECTIONS.

THE MOST COMMON INTERSECTION COLLISIONS WERE 'RIGHT ANGLE', 'LEFT TURN WITH OPPOSING THROUGH' AND 'REAR END'.

THE MOST COMMON NON-INTERSECTION COLLISIONS WERE 'REAR END' AND 'SINGLE MOTOR VEHICLE'.

(a) "OTHER" includes 'at railroad', 'underpass or tunnel', 'overpass or bridge' and 'other'.





Exhibit 2.8

INITIAL IMPACT TYPE VS TYPE OF TRAFFIC CONTROL

TYPE OF TRAFFIC CONTROL AT LOCATION (a)

INITIAL IMPACT TYPE	TRAFFIC		STOP SIGN	YIELD SIGN	POLICE		SCHOOL		BUS	TRAFFIC		TRAFFIC		TOTAL
	SIGNAL	NO			CONTROL	GUARD	GUARD	SCHOOL		GATE	PERSON*	CONTROL	CONTROL	
REAR END	568	275	19		4	3			0	1	5	830	1	1706
HEAD ON	18	31	1		0	0			0	0	0	123	1	174
SIDE SWIPE (OPPOSITE DIRECTION)	9	20	0		0	0			0	0	0	72	1	102
SIDE SWIPE REAR	153	103	3		0	0			0	0	1	270	2	532
OVERTAKING	22	11	0		1	0			0	0	0	50	0	84
RIGHT TURN REAR END	41	27	1		0	0			0	0	0	21	0	90
RIGHT TURN ONCOMING	18	25	0		0	0			0	0	0	14	0	57
LEFT TURN ONCOMING	52	146	1		0	0			0	0	1	91	1	292
LEFT TURN REAR END	25	37	2		0	0			0	0	0	27	0	91
LEFT TURN OPPOSING THROUGH	369	109	2		0	0			0	0	0	107	0	587
RIGHT ANGLE	548	575	2		0	0			0	0	0	138	4	1267
RIGHT TURN SIDE SWIPE	4	1	0		0	0			0	0	0	0	0	5
THRU. WITH RIGHT (SAME DIRECT'N)	22	16	0		1	0			0	0	0	38	0	77
LEFT TURN SIDE SWIPE	9	2	0		0	0			0	0	0	1	0	12
THRU. WITH LEFT (SAME DIRECT'N)	99	51	0		0	0			0	0	0	58	0	208
S.M.V./PARKED VEHICLE	27	128	1		0	0			0	0	0	445	1	602
S.M.V./OTHER	106	167	7		2	0			0	1	1	600	7	891
PEDESTRIAN/VEHICLE	122	68	0		0	1			0	0	0	88	2	281
LEFT TURN WITH RIGHT TURN	6	2	0		0	0			0	0	0	1	0	9
OTHER	14	47	1		0	0			0	0	2	102	0	166
TOTAL	2232	1841	40		8	4			0	2	10	3076	20	7233
%	30.9%	25.5%	0.6%		0.1%	0.1%			0.0%	0.0%	0.1%	42.5%	0.3%	100.0%

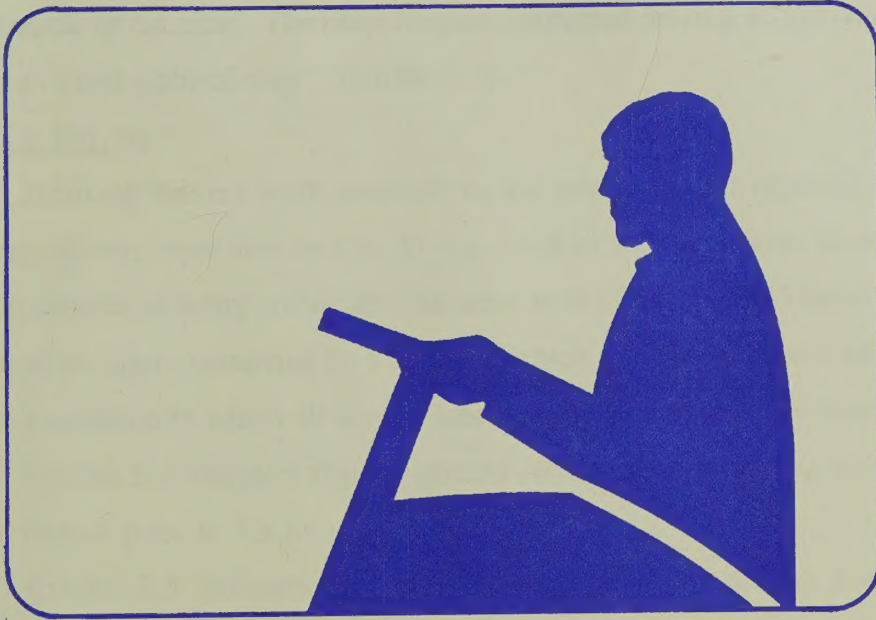
42% OF ALL COLLISIONS OCCURRED AT LOCATIONS WITH NO TRAFFIC CONTROL.

THE MOST COMMON COLLISION TYPE AT A TRAFFIC SIGNAL WAS 'REAR END'.

THE MOST COMMON COLLISION TYPE AT A STOP SIGN WAS 'RIGHT ANGLE'.

(a) Includes all collisions at both intersection and non-intersection locations.

* Any person directing traffic who is not a police officer or school crossing guard.



Chapter Three

Drivers



Chapter 3

Driver Age

Although persons under the age of 25 make up only 14.8 percent of the licensed driving population, this age group was represented by 19 percent of drivers reported in collisions. (Exhibit 3.1).

Drivers over the age of 64, involved in a collision, were recorded as driving properly only 44.3 percent of the time. The most frequent improper driving action recorded for this group was "failed to yield right-of-way" (Exhibit 3.2).

Drinking Drivers

Drinking drivers were involved in 5.0 percent of all reported collisions (Exhibit 3.3). Drinking drivers were involved in 15.4 percent of fatal collisions (down from 26.6% in 1993) and 6.8 percent of injury collisions (the same as in 1993). In 1985 there was a 33 percent greater chance of an injury occurring in a collision which involved a driver who had consumed alcohol than in a collision in which all drivers were sober; there was a 7 percent greater chance in 1994.

Exhibit 3.4 indicates that 74 percent of collisions involving alcohol occurred during the period from 6 p.m. to 3 a.m.

Exhibit 3.5 indicates that only 22 percent of the drivers involved in collisions who admitted to alcohol consumption but were not legally impaired, were driving properly. Less than 3 percent of drivers who were legally impaired due to alcohol were recorded as driving properly at the time of the collision. The most frequently indicated improper driver action was loss of control of the vehicle.

Drivers between the ages twenty and forty-four had the highest probability of being under the influence of alcohol at the time of a collision (Exhibit 3.6).

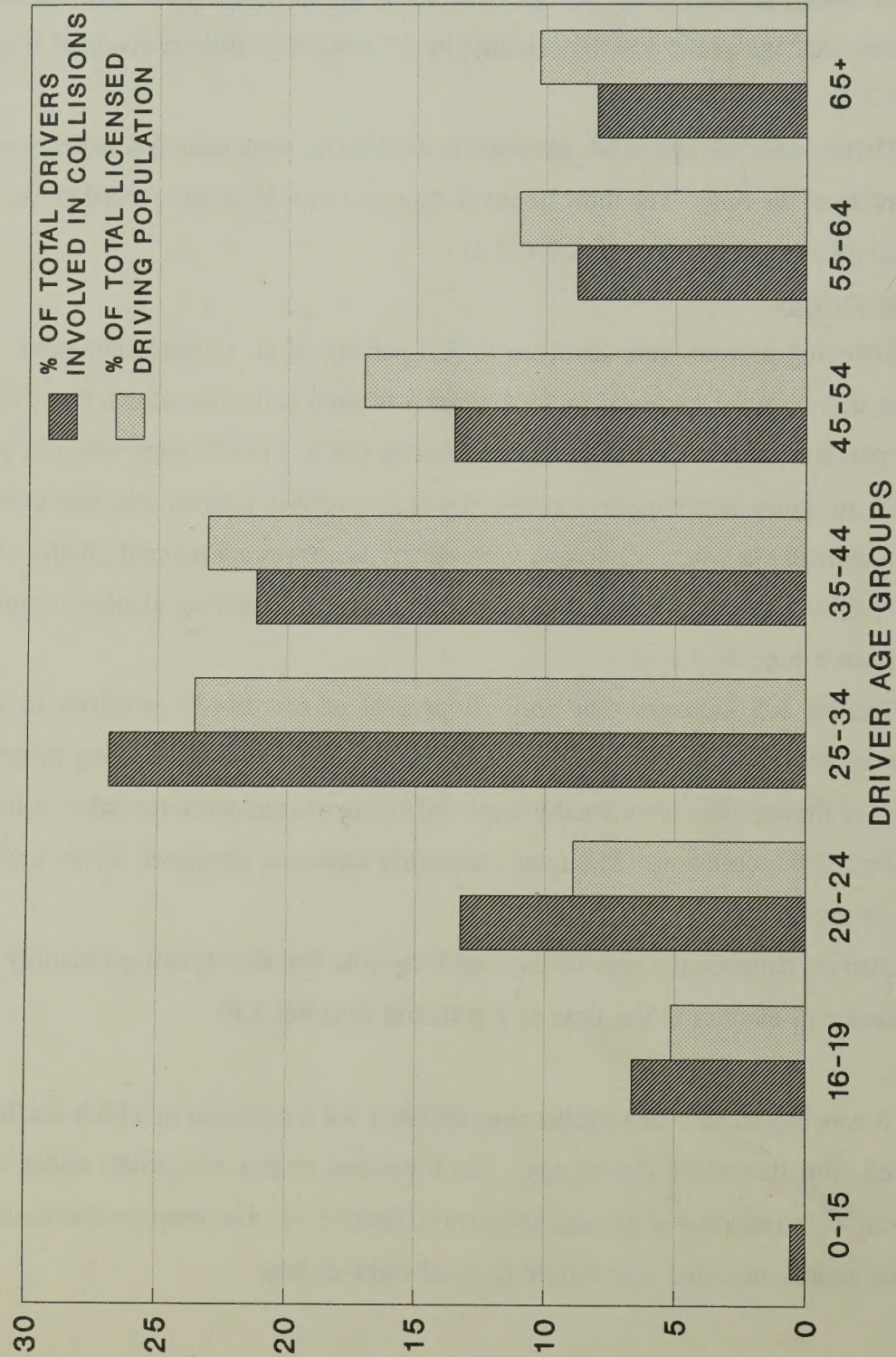
Cyclists

It was determined that cyclist responsibility for a collision in which she/he was involved decreased with increasing cyclist age. 26.5 percent or less of cyclists under 19, involved in collisions, were recorded as driving properly (Exhibit 3.7). The most predominant known cyclist improper action indicated was failure to yield right-of-way.



Exhibit 3.1

MOTOR VEHICLE DRIVER AGE VS COLLISION INVOLVEMENT



DRIVERS UNDER 35 YEARS OF AGE ARE INVOLVED IN MORE COLLISIONS THAN EXPECTED BASED ON THE AGE DISTRIBUTION OF THE LICENSED DRIVING POPULATION OF ONTARIO.



Exhibit 3.2

MOTOR VEHICLE DRIVER AGE vs DRIVER ACTION

DRIVER ACTION	<u>DRIVER AGE</u>										% OF ALL	
	0-15	16-19	20-24	25-34	35-44	45-54	55-64	65-74	75+	TOTAL	ACTIONS	
DRIVING PROPERLY	12	288	782	1868	1453	1043	615	329	104	6494	51.6%	
FOLLOWING TOO CLOSE	1	93	186	357	244	100	71	53	20	1125	8.9%	
EXCEEDING SPEED LIMIT	1	9	8	14	4	1	1	0	0	38	0.3%	
SPEED TOO FAST	0	27	30	44	42	17	10	1	3	174	1.4%	
SPEED TOO SLOW	0	0	0	0	0	1	0	0	0	1	0.0%	
IMPROPER TURN	5	37	66	122	117	94	80	55	22	598	4.8%	
DISOBEYED TRAFFIC CONTROL	7	60	104	157	112	62	46	53	24	625	5.0%	
FAILED TO YIELD R.O.W.	25	96	170	329	245	181	154	123	65	1388	11.0%	
IMPROPER PASSING	1	4	15	34	21	15	10	3	0	103	0.8%	
LOST CONTROL	13	115	158	282	185	93	62	36	15	959	7.6%	
WRONG WAY ON ONE-WAY	1	3	2	10	7	6	5	3	1	38	0.3%	
IMPROPER LANE CHANGE	1	28	51	78	58	53	45	23	6	343	2.7%	
OTHER	18	40	87	197	154	92	41	43	16	688	5.5%	
TOTAL	85	458	958	3492	2642	1758	1140	722	276	12574	100.0%	
% DRIVERS INVOLVED	17.9%	68.9%	89.8%	56.7%	58.4%	62.6%	56.0%	48.5%	40.0%	54.6%		
DRIVING PROPERLY (a)												

THE OVERALL PERCENTAGE OF DRIVERS DRIVING PROPERLY WAS 54%.

OLDER DRIVERS WERE LEAST LIKELY TO BE DRIVING PROPERLY.

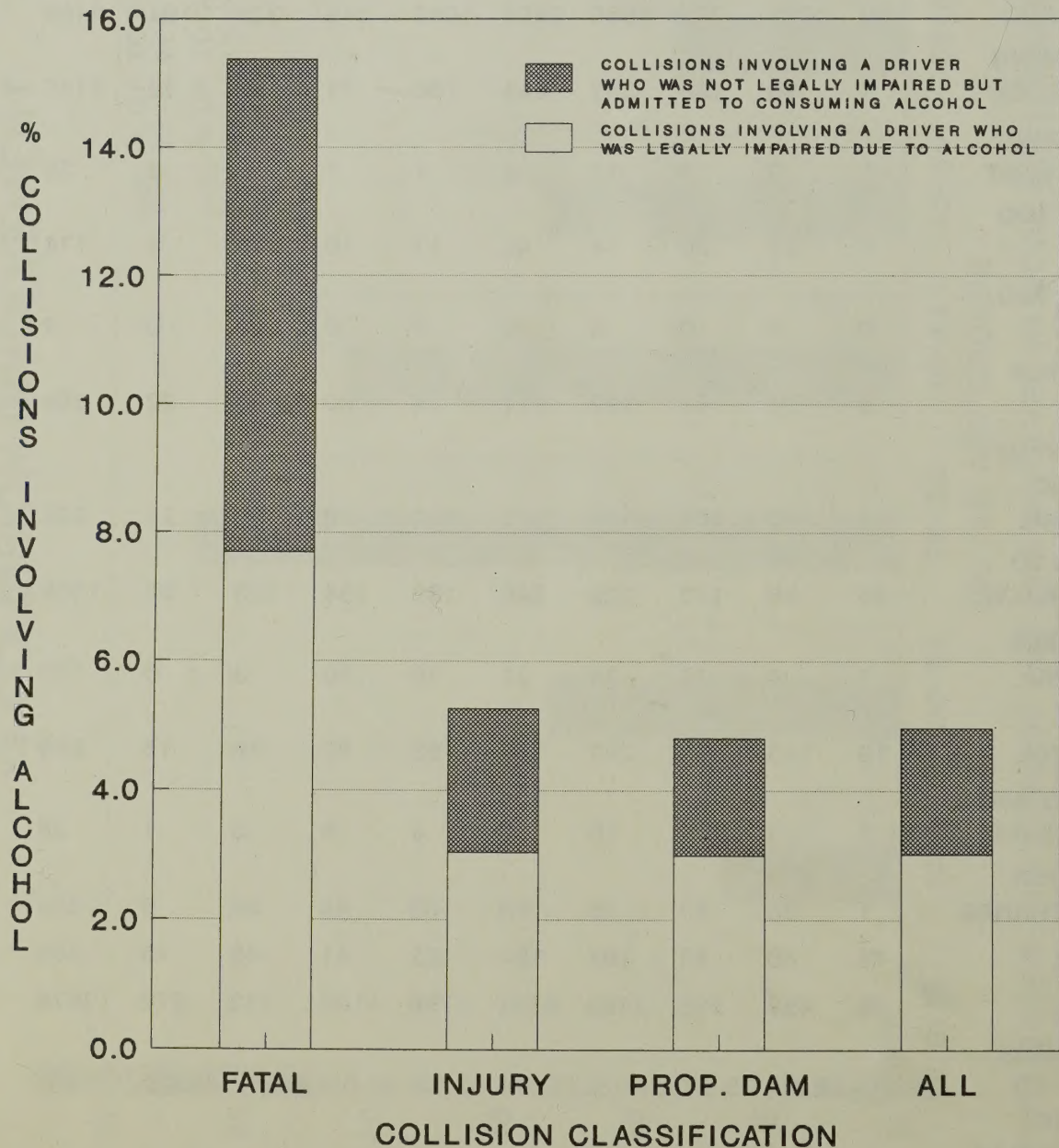
THE MOST FREQUENTLY RECORDED IMPROPER DRIVING ACTION WAS FAILING TO YIELD RIGHT-OF-WAY.

(a) Excluding "Other".



Exhibit 3.3

ALCOHOL INVOLVEMENT vs COLLISION CLASSIFICATION



5.0% OF ALL COLLISIONS INVOLVED A
DRIVER WHO HAD CONSUMED ALCOHOL.



Exhibit 3.4

COLLISIONS INVOLVING ALCOHOL vs TIME OF DAY AND DAY OF WEEK

TIME OF DAY	DAY OF WEEK							TOTAL
	MON	TUES	WED	THUR	FRI	SAT	SUN	
12-1 a.m.	0	3	5	5	4	9	8	34
1-2 a.m.	1	2	4	5	7	22	15	56
2-3 a.m.	1	1	0	4	3	5	7	21
3-4 a.m.	0	1	1	1	1	2	4	10
4-5 a.m.	0	0	1	0	1	1	2	5
5-6 a.m.	0	0	0	0	0	0	1	1
6-7 a.m.	0	0	0	0	0	2	0	2
7-8 a.m.	0	0	0	0	1	0	2	3
8-9 a.m.	0	0	0	0	2	0	0	2
9-10 a.m.	0	0	0	0	1	0	0	1
10-11 a.m.	0	0	0	1	1	0	1	3
11-12 noon	0	0	0	0	0	1	1	2
12-1 p.m.	0	0	0	0	4	2	0	6
1-2 p.m.	0	0	1	0	1	2	1	5
2-3 p.m.	2	0	2	0	1	1	1	7
3-4 p.m.	1	3	1	0	1	1	0	7
4-5 p.m.	1	2	3	5	4	5	2	22
5-6 p.m.	3	1	0	1	1	1	5	12
6-7 p.m.	0	2	0	9	5	3	3	22
7-8 p.m.	2	2	1	4	2	4	4	19
8-9 p.m.	5	1	2	0	3	6	4	21
9-10 p.m.	1	4	3	3	6	10	5	32
10-11 p.m.	5	5	3	5	7	9	5	39
11-12 midnight	2	4	1	5	4	5	2	23
UNKNOWN	0	0	0	0	3	1	0	4
TOTAL	24	31	28	48	63	92	73	359

**MOST COLLISIONS INVOLVING ALCOHOL OCCURRED IN THE EVENING
FROM 6 p.m. TO 3 a.m.**



Exhibit 3.5

DRIVER ACTION vs

DRIVER CONDITION

DRIVER ACTION	IMPAIRED—				
	NORMAL	HAD BEEN DRINKING (a)	ALCOHOL OVER .08 (b)	IMPAIRED— ALCOHOL (c)	IMPAIRED— DRUGS (d)
DRIVING PROPERLY	6263	33	3	2	0
FOLLOWING TOO CLOSE	921	11	11	5	1
EXCEEDING SPEED LIMIT	26	4	5	0	0
SPEED TOO FAST	146	8	8	0	0
SPEED TOO SLOW	1	0	0	0	0
IMPROPER TURN	512	10	9	3	1
DISOBEYED TRAFFIC CONTROL	526	12	16	8	0
FAILED TO YIELD R.O.W.	1209	17	3	1	0
IMPROPER PASSING	76	1	1	1	0
LOST CONTROL	702	47	75	15	3
WRONG WAY ON ONE-WAY	30	1	2	0	0
IMPROPER LANE CHANGE	291	7	4	1	0
OTHER	483	25	29	9	0
TOTAL	11186	176	166	45	5
% DRIVERS INVOLVED DRIVING PROPERLY (e)	58.5%	21.9%	2.2%	5.6%	0.0%

LESS THAN 22% OF DRIVERS WHO HAD BEEN DRINKING AND LESS THAN 3% OF DRIVERS WHO WERE IMPAIRED DUE TO ALCOHOL WERE RECORDED AS DRIVING PROPERLY AT THE TIME OF THE COLLISION.

(a) Driver had consumed alcohol but their physical condition was not legally impaired.

(b) Driver had consumed alcohol and upon testing was found to have a blood-alcohol level in excess of 80 mg.



DRIVER CONDITION

MEDICAL

FATIGUE	DISABILITY	INATTENTIVE	UNKNOWN	OTHER	TOTAL	%
0	5	10	297	4	6617	49.9%
0	1	43	186	1	1180	8.9%
0	0	2	9	1	47	0.4%
0	0	5	28	0	195	1.5%
0	0	0	0	0	1	0.0%
1	0	22	73	0	631	4.8%
3	2	26	76	1	670	5.1%
0	3	56	174	1	1464	11.0%
0	0	1	40	0	120	0.9%
14	13	23	176	4	1072	8.1%
0	0	1	8	0	42	0.3%
1	0	8	73	0	385	2.9%
3	4	19	245	11	828	6.2%
22	28	216	1385	23	13252	100.0%
0.0%	20.8%	5.1%	26.1%	33.3%	53.3%	

- (c) Driver had consumed sufficient alcohol to warrant being charged with a drinking and driving offence in the judgement of the investigating officer.
 (d) Driver had used drugs and was legally impaired in the judgement of the investigating officer.
 (e) Excluding not known and other.



Exhibit 3.6

DRIVER AGE vs DRIVER CONDITION

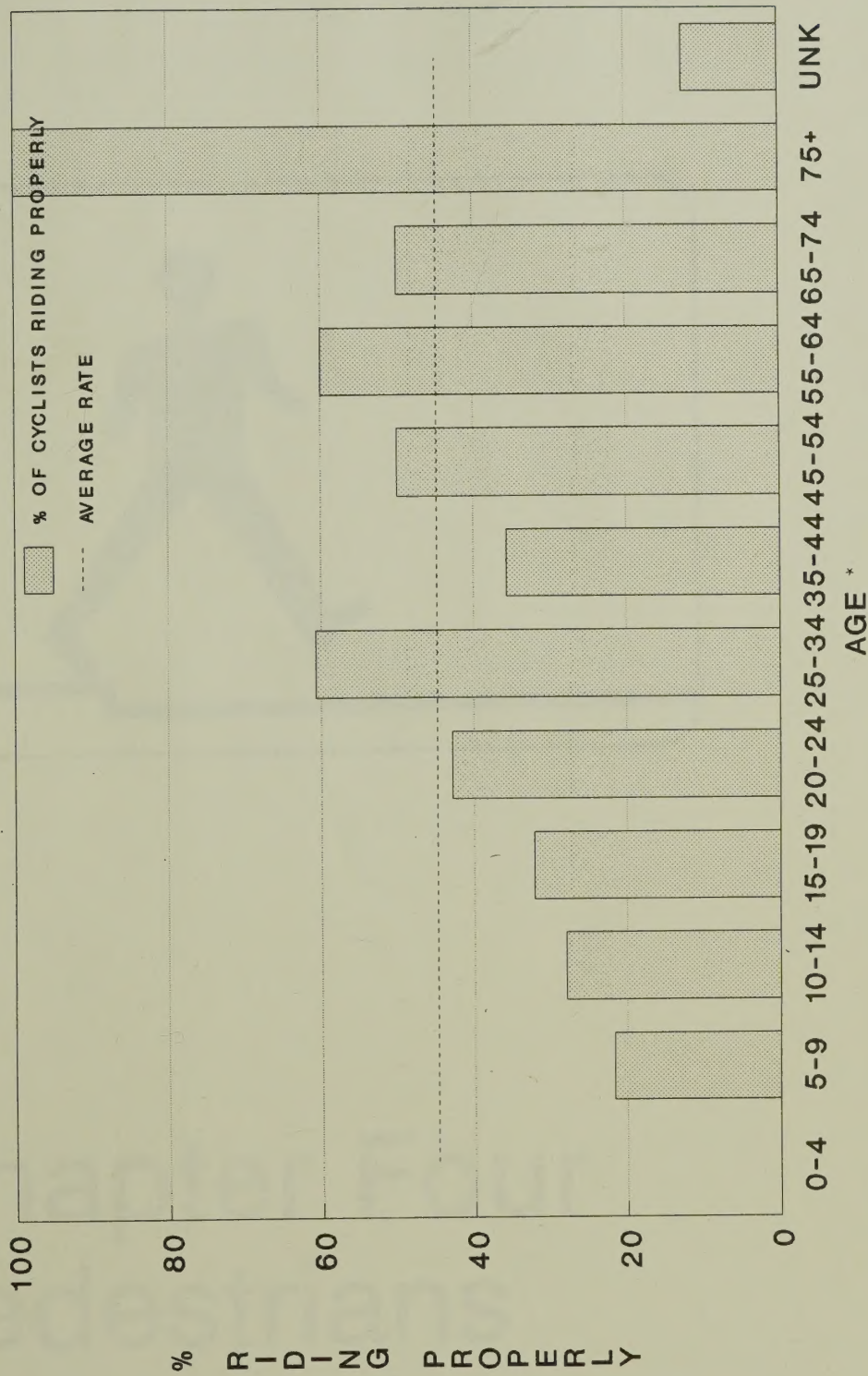
DRIVER CONDITION	DRIVER AGE										NO DRIVER	UNKNOWN	TOTAL	%
	0-15	16-19	20-24	25-34	35-44	45-54	55-64	65-74	75 +					
NORMAL	54	741	1459	2924	2314	1518	971	638	256	1	204	11080	85.0%	
HAD BEEN DRINKING	1	6	24	49	30	13	7	4	1	0	10	145	1.1%	
IMPAIRED- ALCOHOL OVER .08	0	3	19	58	55	20	15	7	0	0	1	178	1.4%	
IMPAIRED- ALCOHOL	1	1	2	19	12	6	2	0	1	0	3	47	0.4%	
IMPAIRED- DRUGS	0	0	1	4	2	0	0	1	0	0	0	8	0.1%	
FATIGUE	0	0	3	3	6	4	2	1	0	0	0	19	0.1%	
MEDICAL DISABILITY	0	2	0	4	9	5	4	4	0	0	0	28	0.2%	
INATTENTIVE	6	19	31	51	36	18	19	8	7	0	3	198	1.5%	
NOT KNOWN	6	56	120	244	186	111	80	49	26	0	434	1312	10.1%	
OTHER	3	2	1	6	4	3	1	0	1	0	6	27	0.2%	
TOTAL	71	830	1660	3362	2654	1698	1101	712	292	1	661	13042	100.0%	
% DRINKING DRIVERS INVOLVED (a)	3.2%	1.3%	2.9%	4.0%	3.9%	2.5%	2.4%	1.7%	0.8%	0.0%	6.3%			

DRIVERS IN THE AGE GROUP 20 TO 44 WERE MOST LIKELY TO HAVE CONSUMED ALCOHOL BEFORE BEING INVOLVED IN A COLLISION.

(a) Excluding not known and other.



Exhibit 3.7 CYCLIST ACTIONS IN MOTOR VEHICLE COLLISIONS: PERCENTAGE RIDING PROPERLY VS AGE GROUP



THE 5 TO 9 YEAR OLD AGE GROUP HAD THE

POOREST RIDING PERFORMANCE. Very few involved cyclists were over the age of 44.



1994 Hamilton-Wentworth Collision Report

DRIVERS



Chapter Four

Pedestrians



Chapter 4

General

In 1994, there were 290 pedestrian collisions (Exhibit 1.6) resulting in 283 pedestrian injuries and 3 pedestrians fatalities (16 pedestrians were involved in a collision but were not hurt).

Age

The relationship between the Regional population distribution and pedestrian involvement in collisions in 1994 was reviewed (Exhibit 4.1). It was determined that pedestrians between the ages of 5 and 19 and over 75 years of age were significantly over-represented in pedestrian collisions when compared to the age distribution of the Regional population.

Pedestrian Action

Exhibit 4.2 shows the pedestrian actions at the time of the collisions versus pedestrian age. In general, the instances of unsafe pedestrian action were greatest for pedestrians under 10-14 years of age.

This exhibit also indicates that the actions of "coming from behind a parked car" or "unexpectedly running into the roadway" accounted for 21.8 percent of pedestrian actions at the time of the collision. These unsafe actions are particularly associated with pedestrians under 15 years of age.

In 49 percent of all pedestrian collisions the pedestrian was involved in an unsafe action (e.g. crossing illegally at a traffic signal).

Examination of the data for pedestrian collisions at traffic signals indicates that in 72% of cases, the pedestrian was not at fault (Exhibit 4.3).

Time of Collisions

The time of day when collisions occurred was compared to the number of pedestrians injured (Exhibit 4.4). It was determined that 12.3 percent of pedestrians were injured in collisions which occurred between 3 p.m. and 4 p.m. Exhibit 4.5 compares the time of day of pedestrian collisions with pedestrian age. 25 pedestrians between the ages 5 to 14 were



involved in pedestrian collisions which occurred at school crossing times.* This represents 8.8 percent of the 283 pedestrians involved in collisions in 1994.

- * School crossing times: 8:00 a.m. - 9:00 a.m., 12 noon - 1:30 p.m.
3:30 p.m. - 4:45 p.m., Monday - Friday; excluding July and August.

Pedestrian Condition

In most cases, the condition of the pedestrian (Exhibit 4.6) involved in the collision was reported as normal (68% of the time). However, in 12.2 percent of the collisions involving pedestrians, the pedestrian admitted to alcohol consumption or was legally impaired.

Location

Exhibit 4.7 examines the type of traffic control at locations where pedestrian collisions occurred. In 43 percent of the pedestrian collisions, the collision occurred at a non-intersection location with no control, 37% at a traffic signal controlled intersection, and 17 percent at a stop sign controlled intersection.

Driver Action

Exhibit 4.8 indicates that in 70 percent of the motor vehicle/pedestrian collisions, the driver was recorded as driving properly. This figure does not necessarily suggest that the drivers involved in these collisions were totally without blame but does indicate that a majority of pedestrian collisions are associated with improper pedestrian action or lack of awareness of traffic conditions at the time of the collision.

Of the 34 percent of motor vehicle/pedestrian collisions in which the driver was not driving properly, the most frequently recorded driver action was "failing to yield the right-of-way" (associated with 18.7% of all motor vehicle - pedestrian collisions).

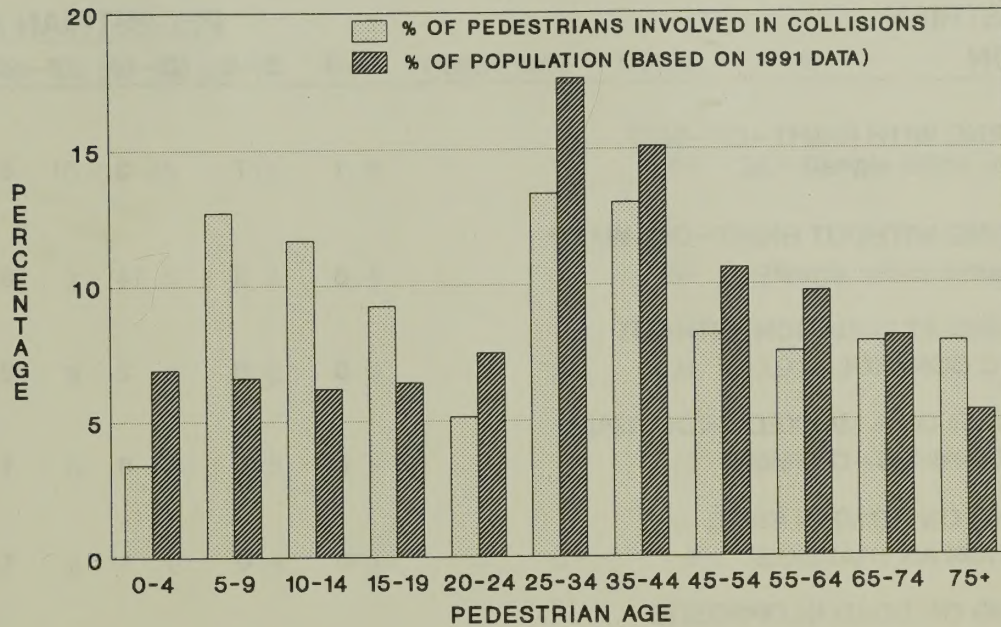
Pedestrian Injuries

Most pedestrians (87%) suffered no, minimal or minor injuries when involved in a collision.

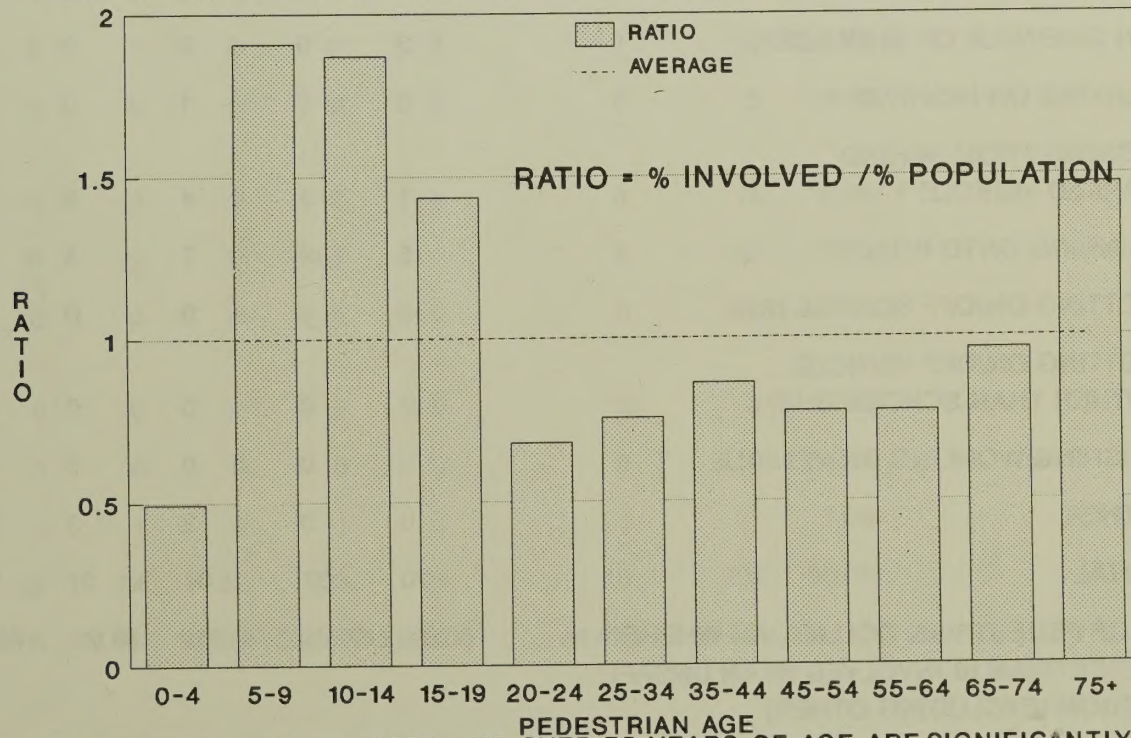


Exhibit 4.1

PEDESTRIAN AGE vs COLLISION INVOLVEMENT



• There were 10 pedestrian collisions where age was not recorded



PEDESTRIANS FROM 5 TO 19 YEARS AND OVER 75 YEARS OF AGE ARE SIGNIFICANTLY OVER-REPRESENTED IN PEDESTRIAN COLLISIONS BASED ON THE AGEDISTRIBUTION OF HAMILTON - WENTWORTH.



Exhibit 4.2

PEDESTRIAN AGE vs PEDESTRIAN ACTION (ALL LOCATIONS)

PEDESTRIAN ACTION	PEDESTRIAN AGE					
	0-4	5-9	10-14	15-19	20-24	25-34
CROSSING WITH RIGHT-OF-WAY (i.e. with traffic signal)	1	7	3	3	4	9
CROSSING WITHOUT RIGHT-OF-WAY * (i.e. against traffic signal)	0	3	14	6	2	10
CROSSING AT LOCATION WITHOUT TRAFFIC CONTROL	0	0	2	2	2	3
CROSSING ON A MARKED CROSSWALK, WITHOUT RIGHT-OF-WAY	0	5	0	1	0	0
WALKING ON ROAD IN SAME DIRECTION AS TRAFFIC *	0	0	1	1	1	3
WALKING ON ROAD IN OPPOSITE DIRECTION AS TRAFFIC	0	0	0	2	0	0
ON SIDEWALK OR SHOULDER	3	0	0	2	2	2
PLAYING ON HIGHWAY *	0	0	1	0	1	1
COMING FROM BEHIND PARKED VEHICLE *	1	3	4	3	0	2
RUNNING ONTO ROAD *	5	19	7	4	2	1
GETTING ON/OFF SCHOOL BUS	0	0	0	0	0	0
GETTING ON/OFF VEHICLE (OTHER THAN SCHOOL BUS)	0	0	0	0	1	1
PUSHING/WORKING ON VEHICLE	0	0	0	0	0	0
OTHER	0	0	2	3	0	7
TOTAL	10	37	34	27	15	39
% OF PEDESTRIAN COLLISIONS WHERE PEDESTRIAN IS INVOLVED IN AN UNSAFE ACTION (EXCLUDING OTHER)	60.0%	67.6%	84.4%	58.3%	40.0%	53.1%

THE INSTANCES OF UNSAFE PEDESTRIAN ACTIONS WERE HIGHEST FOR THE 10-14 YEAR OLD GROUP.

* Actions considered unsafe



35-44	45-54	55-64	65-74	75+	UNKNOWN	TOTAL	%
15	10	13	11	8	1	85	28.1%
6	7	3	4	5	0	60	19.9%
3	3	3	2	2	2	24	7.9%
1	0	0	3	1	1	12	4.0%
0	0	0	1	1	0	8	2.6%
1	0	1	0	1	0	5	1.7%
2	1	0	0	3	1	16	5.3%
0	0	0	0	0	0	3	1.0%
1	0	0	0	0	0	14	4.6%
6	2	0	1	1	4	52	17.2%
0	0	0	0	0	0	0	0.0%
0	0	0	0	0	0	2	0.7%
0	0	0	0	0	0	0	0.0%
3	1	2	1	1	1	21	7.0%
38	24	22	23	23	10	302	100.0%
37.1%	39.1%	15.0%	27.3%	31.8%	44.4%	48.8%	

22% OF PEDESTRIANS INVOLVED IN COLLISIONS ENTERED THE ROADWAY UNEXPECTEDLY (CAME FROM BEHIND PARKED CARS OR RAN INTO THE ROADWAY).



Exhibit 4.3

**PEDESTRIAN AGE vs PEDESTRIAN ACTION
(AT TRAFFIC SIGNALS)**

PEDESTRIAN ACTION	PEDESTRIAN AGE					
	0-4	5-9	10-14	15-19	20-24	25-34
CROSSING WITH RIGHT-OF-WAY (i.e. with traffic signal)	1	4	3	2	4	3
CROSSING WITHOUT RIGHT-OF-WAY * (i.e. against traffic signal)	0	1	5	1	1	3
CROSSING AT LOCATION WITHOUT TRAFFIC CONTROL	0	0	0	0	0	0
CROSSING ON A MARKED CROSSWALK, WITHOUT RIGHT-OF-WAY	0	3	0	1	0	0
WALKING ON ROAD IN THE SAME DIRECTION AS TRAFFIC *	0	0	0	1	0	0
WALKING ON ROAD IN OPPOSITE DIRECTION AS TRAFFIC	0	0	0	0	0	0
ON SIDEWALK OR SHOULDER	0	0	0	0	0	1
PLAYING ON HIGHWAY *	0	0	0	0	0	0
COMING FROM BEHIND PARKED VEHICLE *	0	0	0	1	0	0
RUNNING ONTO ROAD *	0	2	1	0	0	0
GETTING ON/OFF VEHICLE (OTHER THAN SCHOOL BUS)	0	0	0	0	0	0
PUSHING/WORKING ON VEHICLE	0	0	0	0	0	0
OTHER	0	0	0	0	0	0
TOTAL	1	10	9	6	5	7
% OF PEDESTRIAN COLLISIONS WHERE PEDESTRIAN IS INVOLVED IN AN UNSAFE ACTION (EXCLUDING OTHER)	0.0%	30.0%	66.7%	50.0%	20.0%	42.9%

**PEDESTRIANS BETWEEN THE AGES OF 10 AND 14 WERE MORE LIKELY
THAN OTHER AGE GROUPS TO BE INVOLVED IN COLLISIONS
WHICH OCCURRED AT TRAFFIC SIGNALS DUE TO UNSAFE ACTIONS.**

* Actions considered unsafe

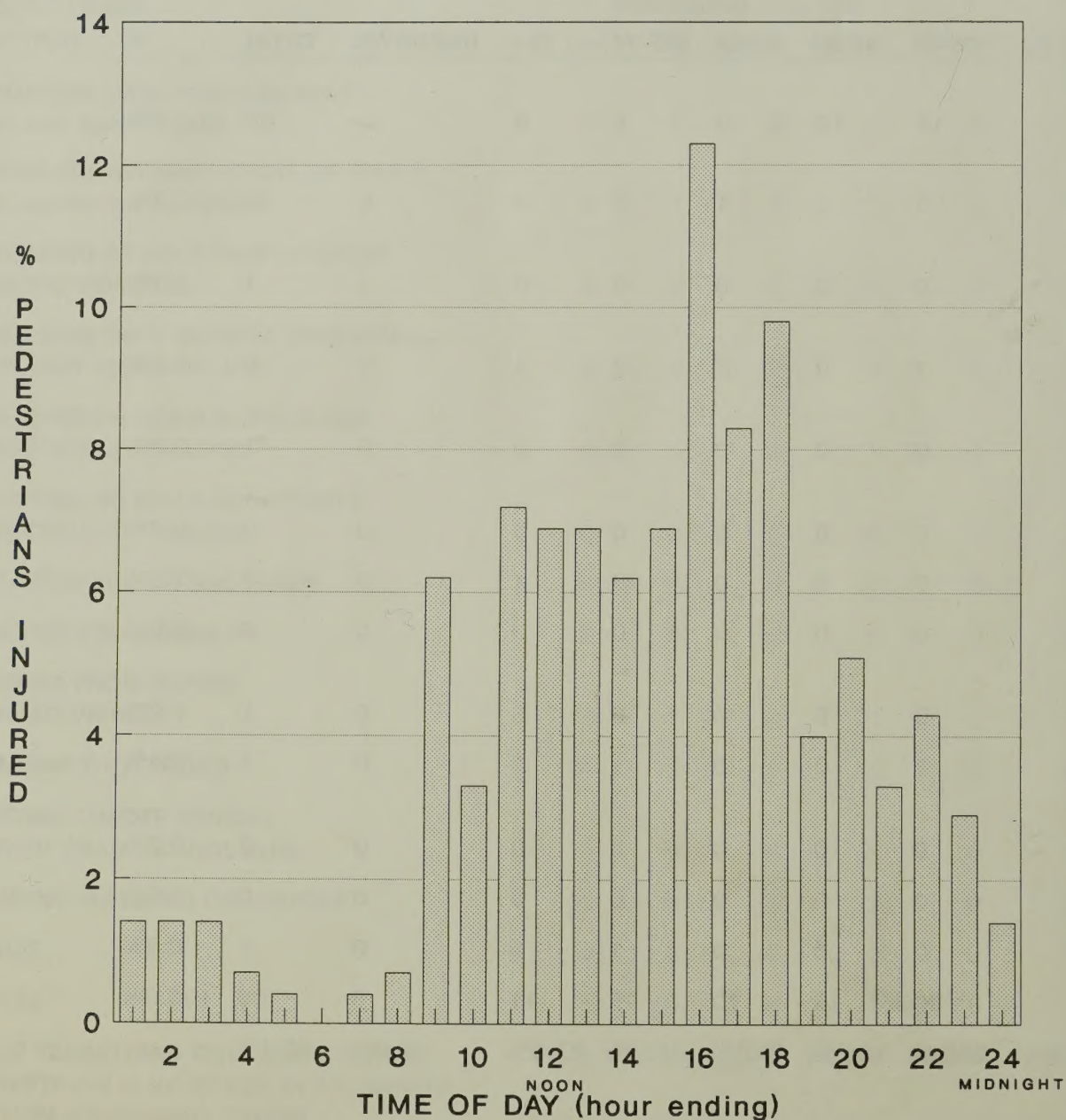


35-44	45-54	55-64	65-74	75+	UNKNOWN	TOTAL	%
14	10	9	8	6	1	65	59.6%
3	2	1	3	2	0	22	20.2%
0	0	0	0	0	1	1	0.9%
1	0	0	2	1	1	9	8.3%
0	0	0	0	0	0	1	0.9%
0	0	0	0	0	0	0	0.0%
0	0	0	0	1	0	2	1.8%
0	0	0	0	0	0	0	0.0%
0	0	0	0	0	0	1	0.9%
2	0	0	1	1	0	7	6.4%
0	0	0	0	0	0	0	0.0%
0	0	0	0	0	0	0	0.0%
0	0	0	1	0	0	1	0.9%
20	12	10	15	11	3	109	100.0%
25.0%	16.7%	10.0%	26.7%	27.3%	0.0%	28.4%	



Exhibit 4.4

TIME OF DAY vs NUMBER OF PEDESTRIANS INJURED



THE HIGHEST NUMBER OF PEDESTRIAN
COLLISIONS OCCURRED BETWEEN THE HOURS OF
3 p.m. - 4 p.m.



Exhibit 4.5

TIME OF DAY vs PEDESTRIAN AGE

PEDESTRIAN AGE

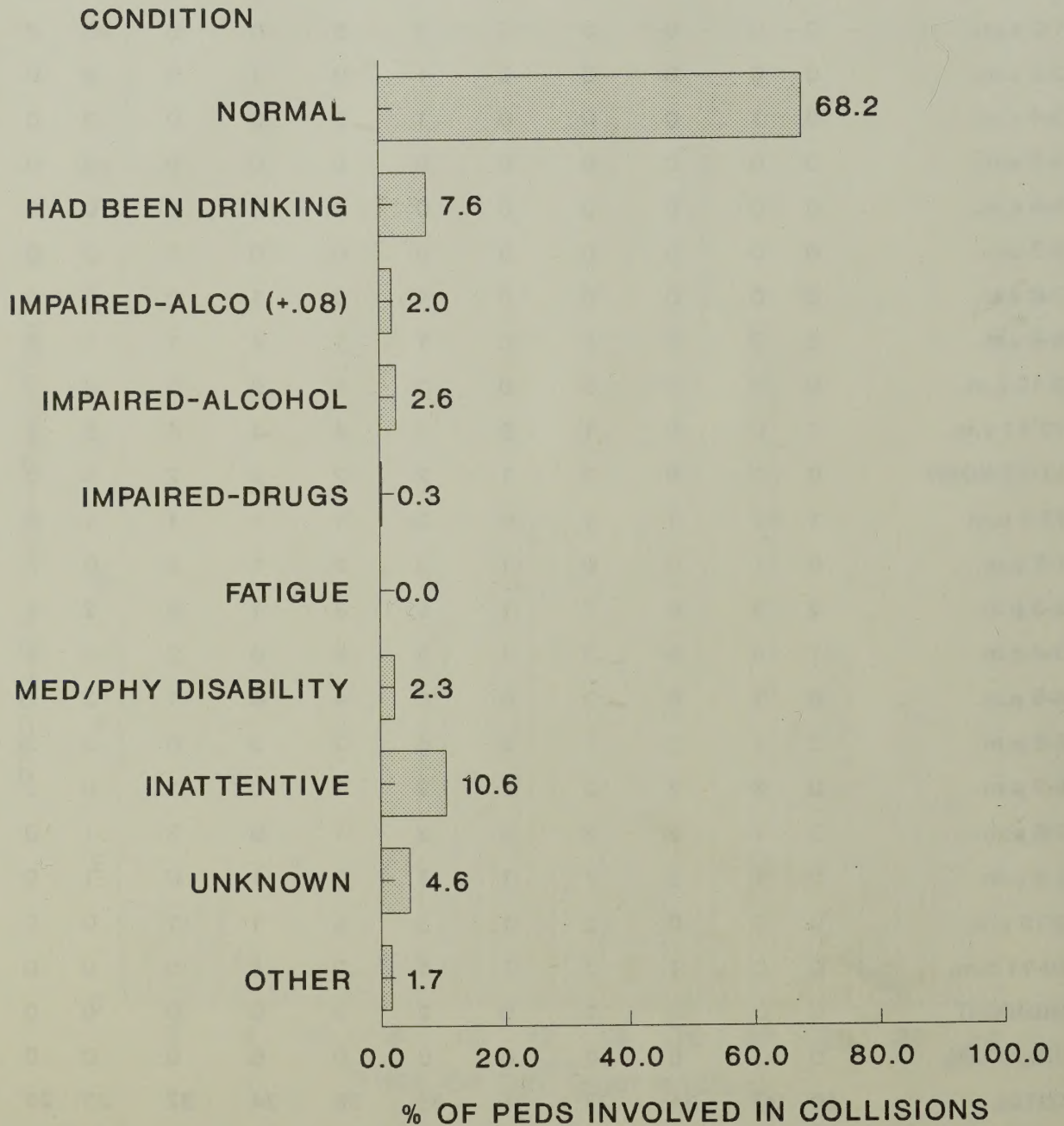
TIME OF DAY	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	75+U/K	TOTAL
12-1 a.m.	0	0	0	3	0	0	0	1	0	1	0	5
1-2 a.m.	0	0	0	0	3	2	0	0	0	0	0	5
2-3 a.m.	0	0	0	0	0	1	0	1	0	0	0	2
3-4 a.m.	0	1	0	0	0	1	0	0	0	0	0	2
4-5 a.m.	0	0	0	0	0	0	0	0	0	0	0	0
5-6 a.m.	0	0	0	0	0	0	0	0	0	0	0	0
6-7 a.m.	0	0	0	0	0	0	0	0	1	0	0	1
7-8 a.m.	0	0	0	0	0	1	0	1	0	0	0	2
8-9 a.m.	0	2	3	5	0	1	1	4	1	1	0	18
9-10 a.m.	0	0	0	0	0	0	1	2	0	3	2	8
10-11 a.m.	1	0	0	1	0	2	4	1	4	5	2	20
11-12 NOON	0	1	6	2	1	2	2	2	2	0	0	18
12-1 p.m.	1	10	1	1	0	2	1	1	1	1	0	19
1-2 p.m.	0	1	0	0	1	3	2	1	2	0	5	15
2-3 p.m.	2	2	0	2	1	1	3	1	3	2	4	21
3-4 p.m.	1	5	9	3	1	3	5	0	2	3	5	37
4-5 p.m.	0	3	6	0	0	4	4	4	1	3	1	26
5-6 p.m.	2	7	2	1	2	5	2	2	0	2	2	27
6-7 p.m.	0	3	2	0	1	2	2	0	1	0	2	13
7-8 p.m.	3	1	2	2	2	2	1	0	3	1	0	17
8-9 p.m.	0	1	2	1	1	1	0	1	0	1	0	8
9-10 p.m.	0	0	0	2	1	3	5	1	1	0	0	13
10-11 p.m.	0	0	1	3	1	1	2	1	0	0	0	9
MIDNIGHT	0	0	0	1	0	2	3	0	0	0	0	6
UNKNOWN	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	10	37	34	27	15	39	38	24	22	23	23	302

PEDESTRIANS

20% OF PEDESTRIANS WERE INVOLVED IN COLLISIONS THAT
OCCURRED BETWEEN THE HOURS OF 3 p.m. - 5 p.m.



Exhibit 4.6 **CONDITION OF PEDESTRIANS
INVOLVED IN COLLISIONS**



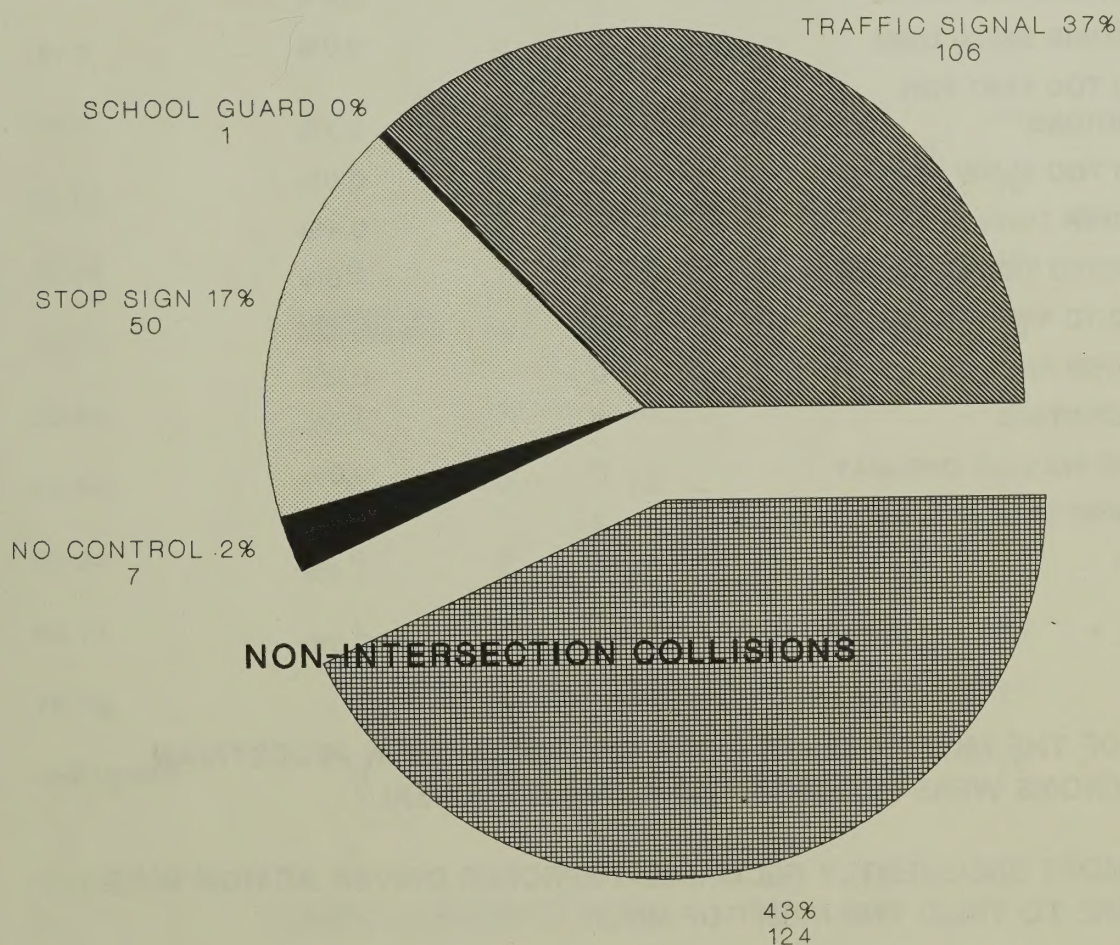
12.2% OF PEDESTRIANS INVOLVED IN
COLLISIONS HAD CONSUMED ALCOHOL.



Exhibit 4.7

TYPE OF TRAFFIC CONTROL AT LOCATIONS WHERE PEDESTRIAN COLLISIONS OCCURRED

COLLISIONS IN AN INTERSECTION



ABOUT ONE HALF OF COLLISIONS AT INTERSECTIONS WITH STOP SIGNS OCCURRED WHILE PEDESTRIAN WAS CROSSING A LEG OF THE INTERSECTION CONTROLLED BY A STOP SIGN. THUS, ABOUT 45% OF ALL PEDESTRIAN COLLISIONS OCCURED UNDER CONDITIONS WHERE THE PEDESTRIAN SHOULD HAVE HAD RIGHT-OF-WAY.



Exhibit 4.8

DRIVER ACTION IN PEDESTRIAN COLLISIONS

ACTION	NUMBER OF	
	DRIVERS	
	INVOLVED	PERCENTAGE
DRIVING PROPERLY	194	69.8%
FOLLOWING TOO CLOSE	1	0.4%
EXCEEDING SPEED LIMIT	0	0.0%
SPEED TOO FAST FOR CONDITIONS	2	0.7%
SPEED TOO SLOW	0	0.0%
IMPROPER TURN	1	0.4%
DISOBEYED TRAFFIC CONTROL	5	1.8%
FAILED TO YIELD R.O.W.	52	18.7%
IMPROPER PASSING	0	0.0%
LOST CONTROL	6	2.2%
WRONG WAY ON ONE-WAY	0	0.0%
IMPROPER LANE CHANGE	2	0.7%
OTHER	15	5.4%
TOTAL *	278	100.0%

70% OF THE MOTOR VEHICLE DRIVERS INVOLVED IN PEDESTRIAN COLLISIONS WERE RECORDED AS DRIVING PROPERLY.

THE MOST FREQUENTLY RECORDED IMPROPER DRIVER ACTION WAS FAILURE TO YIELD THE RIGHT-OF-WAY.

* Pedestrian collisions involved more than one driver or vehicle in some cases. Data not available on driver action in 7 cases.



Exhibit 4.9

PEDESTRIAN AGE vs INJURY STATUS

PEDESTRIAN AGE	<u>STATUS OF INJURY</u>						% MAJOR OR FATAL INJURY
	NONE	MINIMAL	MINOR	MAJOR	FATAL	TOTAL	
0- 4	1	3	3	2	1	10	30.0%
5- 9	3	8	26	0	0	37	0.0%
10-14	2	10	17	4	1	34	14.7%
15-19	1	13	9	3	0	26	11.5%
20-24	0	7	6	2	0	15	13.3%
25-34	1	17	16	5	0	39	12.8%
35-44	3	11	16	8	0	38	21.1%
45-54	0	10	13	1	0	24	4.2%
55-64	0	8	13	2	0	23	8.7%
65-74	1	5	15	2	0	23	8.7%
75-98	1	5	10	6	1	23	30.4%
UNKNOWN	3	6	1	0	0	10	0.0%
TOTAL	16	103	145	35	3	302	12.6%
%	5.3%	34.1%	48.0%	11.6%	1.0%	100.0%	

OF ALL PEDESTRIANS INVOLVED IN COLLISIONS, 87%
SUFFERED NO INJURY OR ONLY MINIMAL OR MINOR INJURIES.



1994 Hamilton-Wentworth Collision Report

PEDESTRIANS

Table with 10 columns: Date, Time, Location, Direction, Pedestrian Age, Pedestrian Sex, Driver Age, Driver Sex, Driver License, Driver Insurance. The table contains 10 rows of data.

Date	Time	Location	Direction	Pedestrian Age	Pedestrian Sex	Driver Age	Driver Sex	Driver License	Driver Insurance
1994-01-01	10:00	1000 Main St	North	25	F	35	M	Valid	Yes
1994-01-02	15:30	500 King St	South	18	M	22	F	Valid	Yes
1994-01-03	08:45	200 Queen St	East	32	F	45	M	Valid	Yes
1994-01-04	12:15	700 York St	West	28	M	30	F	Valid	Yes
1994-01-05	17:00	1500 James St	North	20	F	25	M	Valid	Yes
1994-01-06	09:30	300 Front St	South	35	M	40	F	Valid	Yes
1994-01-07	14:20	600 College St	East	22	F	28	M	Valid	Yes
1994-01-08	11:00	900 Victoria St	West	30	M	35	F	Valid	Yes
1994-01-09	16:45	1200 Adelaide St	North	27	F	32	M	Valid	Yes
1994-01-10	07:15	400 Bay St	South	19	M	24	F	Valid	Yes



Chapter Five

Environment



Chapter 5

Weather and Light Conditions

Exhibit 5.1 indicates that most collisions occurred during clear weather conditions and under daylight conditions.

Road Surface

64 percent of collisions occurred under dry pavement conditions (Exhibit 5.2).

Pavement Markings

As shown in Exhibit 5.3, 83 percent of collisions occurred on roadways where the pavement markings were visible. It is important to note that pavement markings that are not visible to the driver are not necessarily associated with collision cause. Further analysis would be necessary to indicate whether or not there was a causal relationship.

Road Characteristics

The majority of collisions occurred at locations with straight, level geometrics (Exhibit 5.4). Exhibit 5.5 shows that most collisions (both non-intersection and intersection) occurred on two-way, undivided roads.

Normalizing data such as the percentages of various categories of intersections and the traffic volumes passing through those intersections is not presently available, therefore it is not possible to state that one intersection type is less prone to collision occurrence than another. However, the reader is referred to Exhibit 6.2 through 6.5 which rank intersections by the number of collisions and rate of collision occurrence.



Road Location

Exhibit 5.6 indicates that the greatest number of collisions occurred at or near intersections. As the exposure to vehicle conflicts is inherently greater at intersection locations, this result is not unexpected.

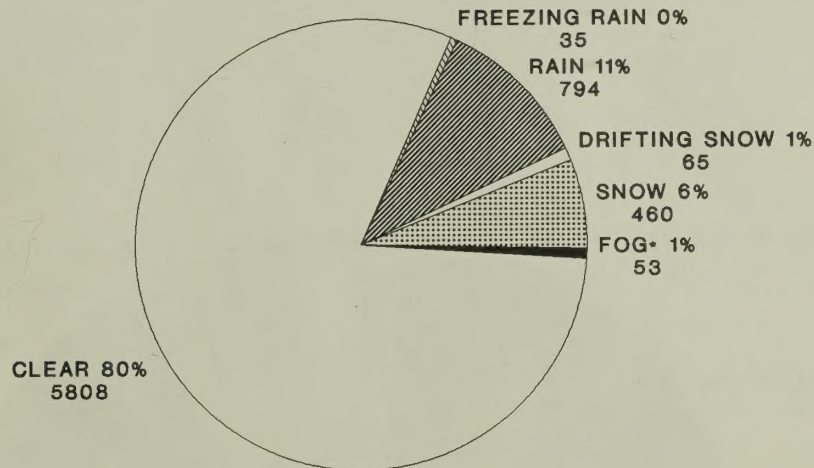
Fixed Objects

There were 578 recorded cases where vehicles struck fixed objects adjacent to the road (Exhibit 5.7). 218 drivers struck utility poles or poles supporting signs, the next most common object hit was a curb (80). In 1993 there were 860 cases overall of a vehicle striking a fixed object.

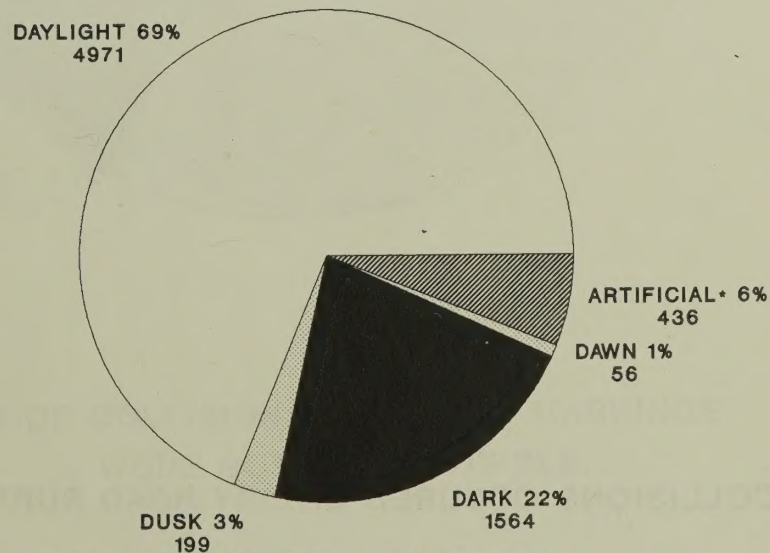


Exhibit 5.1

WEATHER AND LIGHT CONDITIONS IN MOTOR VEHICLE COLLISIONS



* INCLUDES FOG, MIST, SMOKE AND DUST



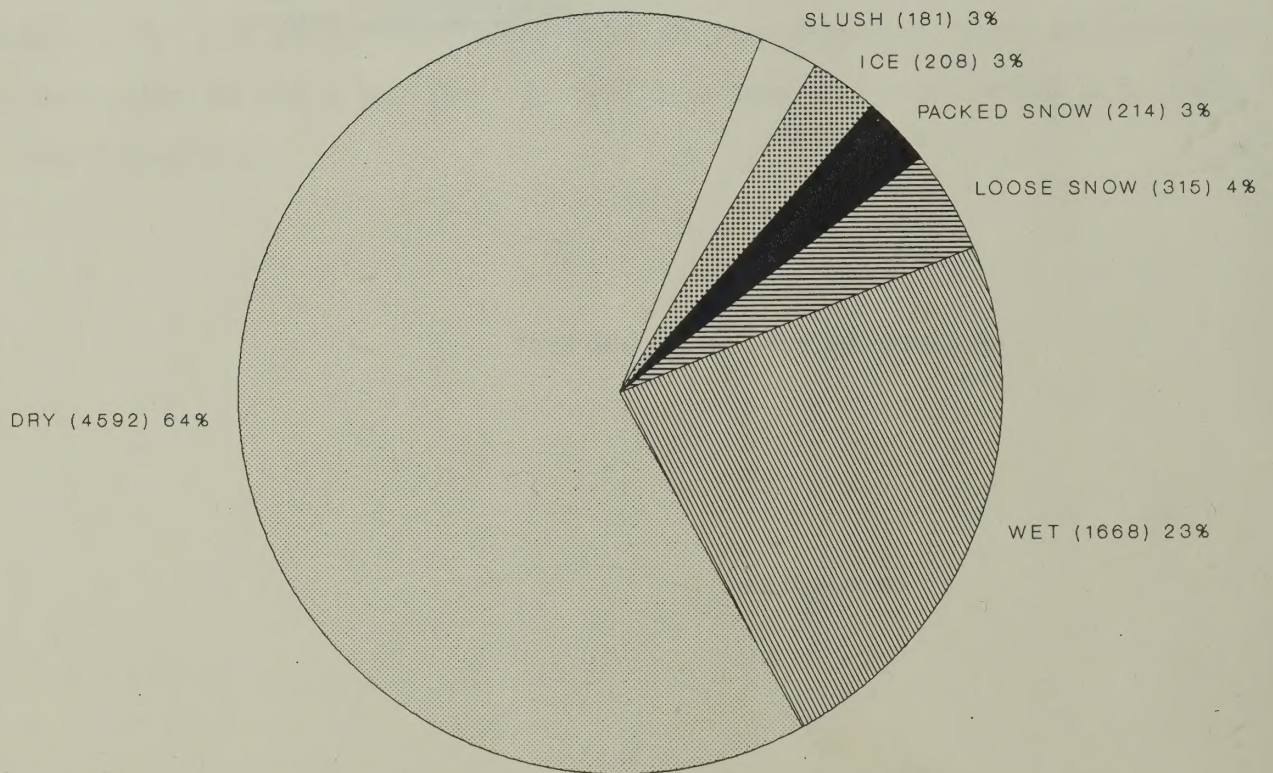
* INCLUDES ARTIFICIAL DAYLIGHT, DAWN, DUSK AND DARK

80% OF COLLISIONS OCCURRED DURING CLEAR WEATHER.
69% OF COLLISIONS OCCURRED IN DAYLIGHT.



Exhibit 5.2

ROAD SURFACE CONDITIONS IN MOTOR VEHICLE COLLISIONS

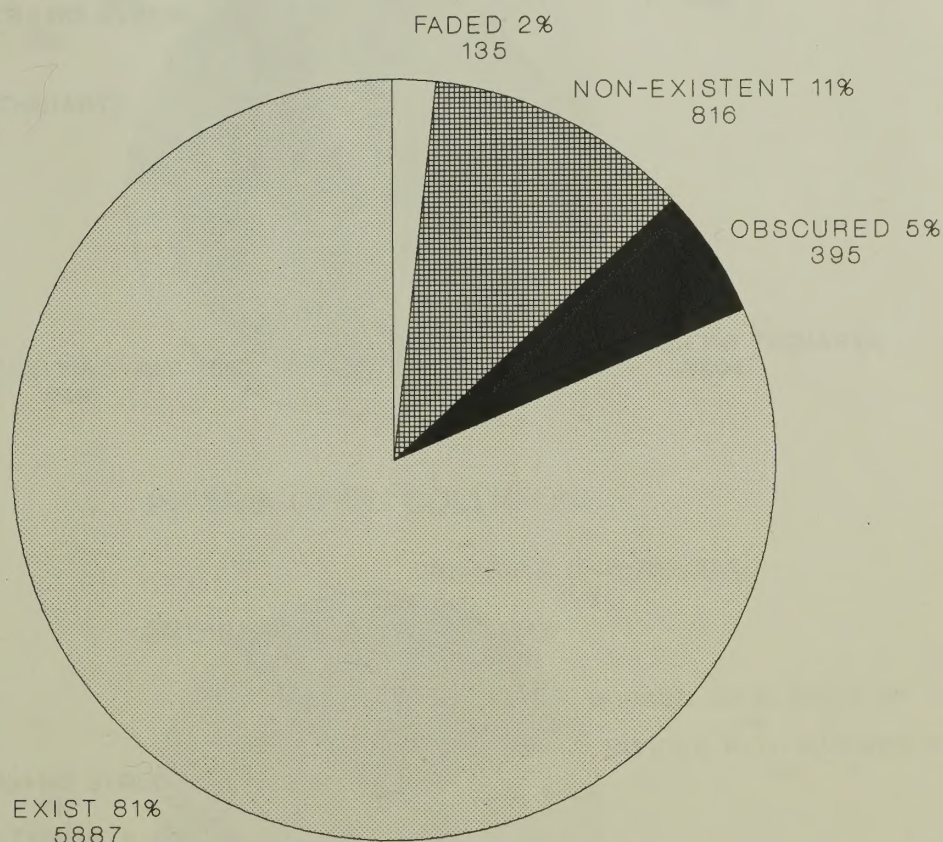


63% OF COLLISIONS OCCURED ON DRY ROAD SURFACES.



Exhibit 5.3

PAVEMENT MARKINGS IN MOTOR VEHICLE COLLISIONS

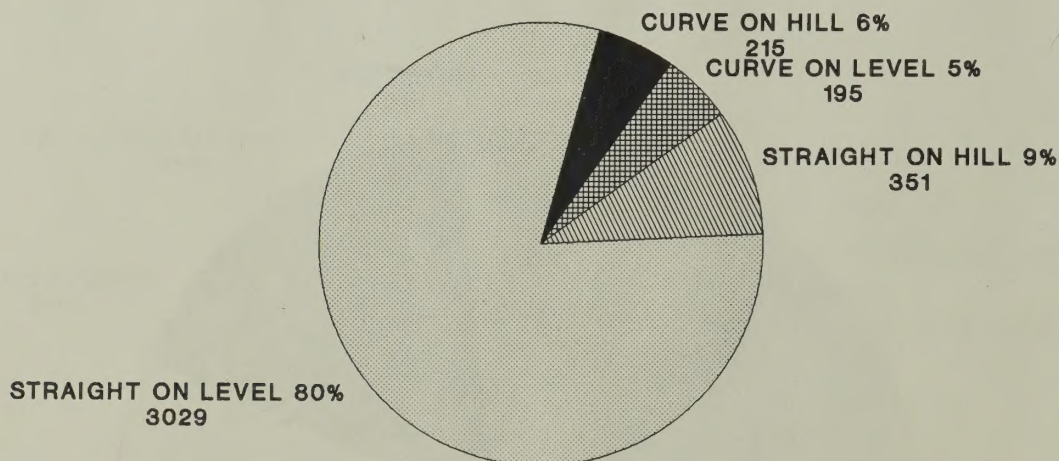


**IN 19% OF COLLISIONS, PAVEMENT MARKINGS
WERE NOT EASILY VISIBLE.**

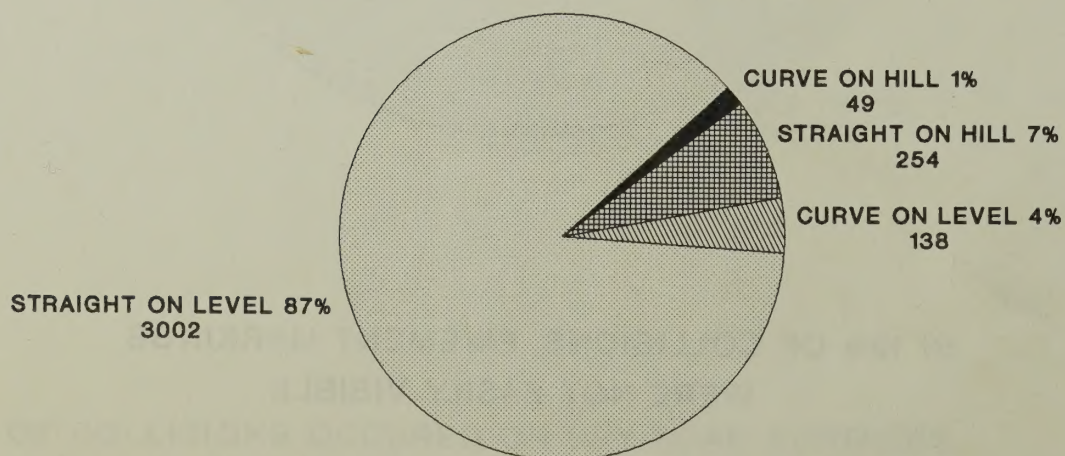


Exhibit 5.4 ROAD ALIGNMENT IN MOTOR VEHICLE COLLISIONS

NON-INTERSECTION COLLISIONS



INTERSECTION COLLISIONS

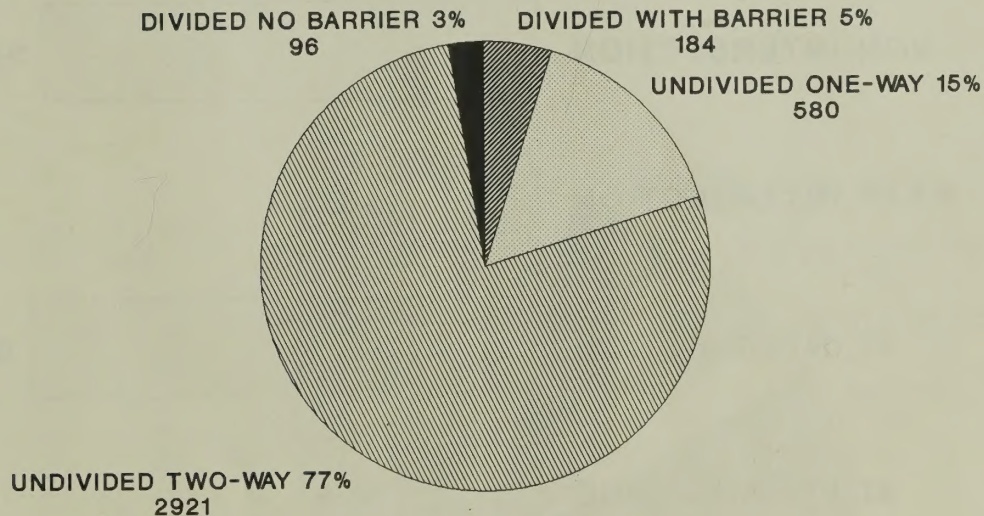


**MOST COLLISIONS OCCURRED AT LOCATIONS WITH
STRAIGHT, LEVEL GEOMETRICS.**

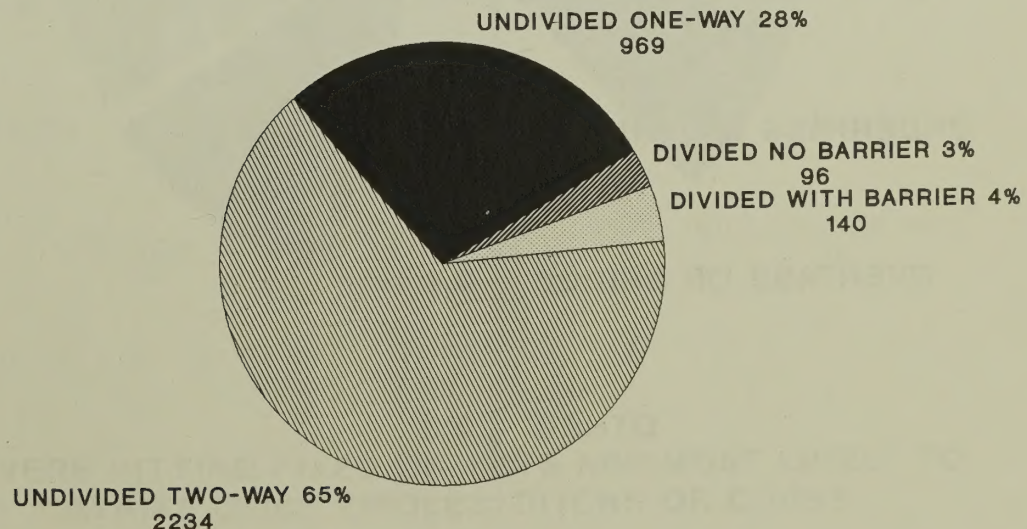


Exhibit 5.5 ROAD CHARACTERISTICS IN MOTOR VEHICLE COLLISIONS

NON-INTERSECTION COLLISIONS



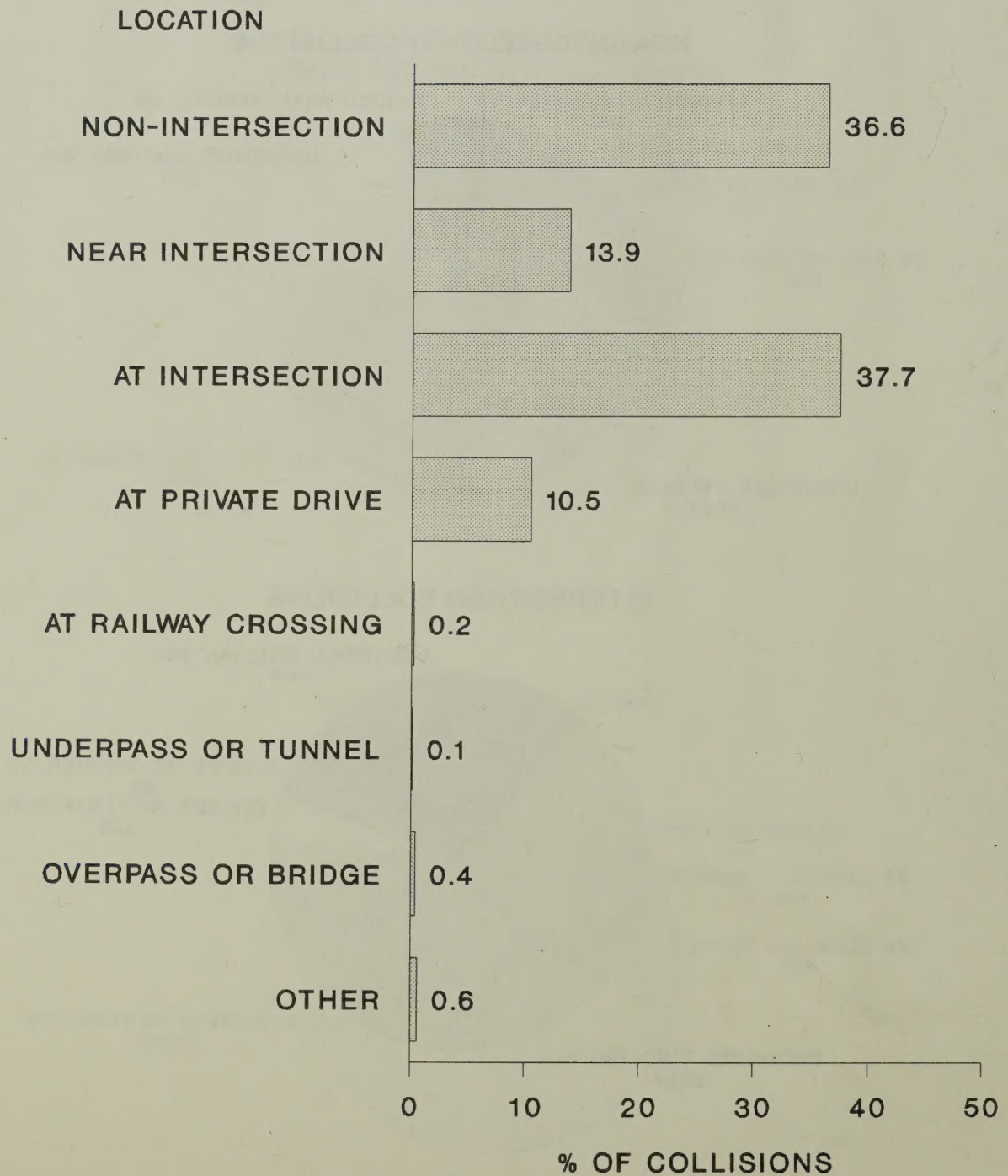
INTERSECTION COLLISIONS



**MOST COLLISIONS OCCURRED ON UNDIVIDED
TWO WAY ROADS**



Exhibit 5.6 LOCATION OF COLLISIONS

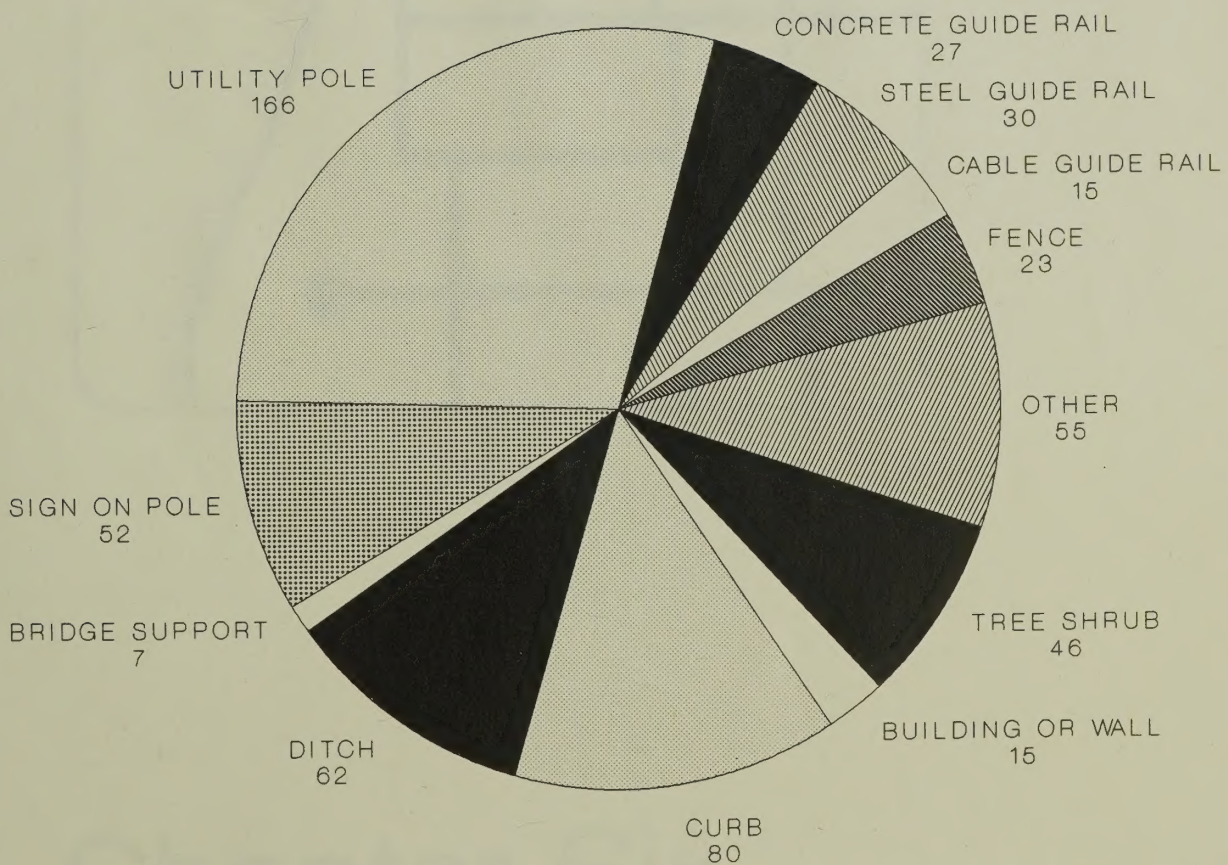


THE LARGEST NUMBER OF COLLISIONS
OCCURRED IN, OR NEAR INTERSECTIONS



Exhibit 5.7

TYPES OF FIXED OBJECTS STRUCK IN MOTOR VEHICLE COLLISIONS



DRIVERS HITTING FIXED OBJECTS ARE MOST LIKELY TO STRIKE UTILITY POLES, DITCHS OR CURBS.



1994 Hamilton-Wentworth Collision Report

TYPE OF TRUCK OBJECT STRUCK IN MOTOR VEHICLE COLLISION

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

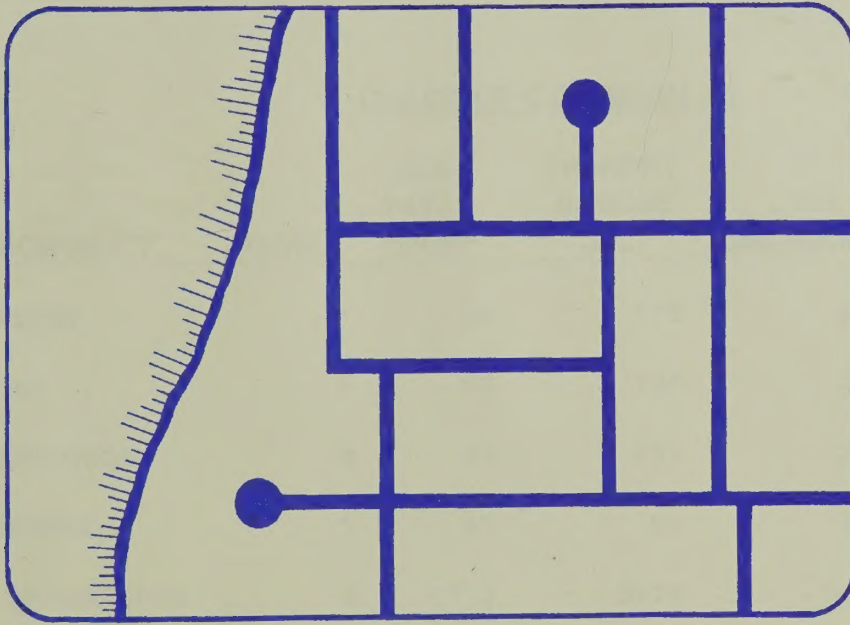
TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE

TRUCK TYPE



Chapter Six

Locations



Exhibit 6.1

COLLISIONS vs AREA MUNICIPALITY

MUNICIPALITY	<u>CLASS OF COLLISION (a)</u>				1994 COLLISIONS RATE PER 1,000 POP.(c)
	FATAL	NON- FATAL INJURY	PROPERTY DAMAGE ONLY	ALL COLLISIONS (b)	
ANCASTER	1	84	172	257	11.1
DUNDAS	1	68	156	225	10.0
FLAMBOROUGH	4	69	187	260	8.2
GLANBROOK	1	42	92	135	13.2
CITY OF HAMILTON	6	1713	3979	5698	17.8
STONEY CREEK	0	229	428	657	12.5
TOTAL FOR THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH	13	2205	5014	7232	16.0

(a) Collisions reported to the Hamilton-Wentworth Regional Police only; areas patrolled by the Provincial Police (e.g. Kings Highways) are not included.

(b) Location data missing from a small number of collisions.

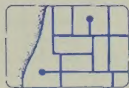


Exhibit 6.2

INTERSECTIONS WITH THE HIGHEST NUMBER OF
COLLISIONS IN 1994 (a)

INTERSECTION	TYPE OF TRAFFIC CONTROL	NUMBER OF COLLISIONS	5 YEAR AVERAGE
1 CENTENNIAL PKWY & QUEENSTON S	TRAFFIC SIGNAL	23	16.0
2 DUNDURN & KING H	TRAFFIC SIGNAL	21	17.4
3 DUNDURN & MAIN H	TRAFFIC SIGNAL	18	19.8
4 BAY & MAIN H	TRAFFIC SIGNAL	16	15.6
5 CANNON & HUGHSON	TRAFFIC SIGNAL	16	6.8
6 GARTH & LIMERIDGE	TRAFFIC SIGNAL	16	14.4
7 MOHAWK H & UPPER JAMES	TRAFFIC SIGNAL	16	12.6
8 BARTON H & GAGE	TRAFFIC SIGNAL	15	12.6
9 CENTENNIAL PKWY & KING S	TRAFFIC SIGNAL	15	9.2
10 LOCKE & YORK BL	TRAFFIC SIGNAL	15	12.0
11 PARKDALE & QUEENSTON H	TRAFFIC SIGNAL	15	7.4
12 CANNON & JAMES ST H	TRAFFIC SIGNAL	14	10.0
13 JOHN H & MAIN H	TRAFFIC SIGNAL	14	14.0
14 BARTON H & CENTENNIAL PKWY	TRAFFIC SIGNAL	13	12.0
15 BARTON H & WELLINGTON H	TRAFFIC SIGNAL	13	7.2
16 CANNON & JOHN H	TRAFFIC SIGNAL	13	8.2
17 JOHN H & WILSON H	TRAFFIC SIGNAL	13	12.6
18 KENILWORTH & MAIN H	TRAFFIC SIGNAL	13	9.4
19 KENILWORTH ACCESS & SHERMAN ACCESS	EB STOP	13	11.6
20 KING H & VICTORIA AV H	TRAFFIC SIGNAL	13	10.4
21 LIMERIDGE RD & UPPER GAGE	TRAFFIC SIGNAL	13	11.8
22 MAIN H & VICTORIA AV H	TRAFFIC SIGNAL	13	12.2



INTERSECTION	TYPE OF TRAFFIC CONTROL	NUMBER OF COLLISIONS	5 YEAR AVERAGE
23 QUEEN H & YORK BL	TRAFFIC SIGNAL	13	8.2
24 ABERDEEN & DUNDURN	TRAFFIC SIGNAL	12	12.8
25 BARTON H & LAKE	TRAFFIC SIGNAL	12	7.8
26 BARTON H & STRATHEARNE AV	TRAFFIC SIGNAL	12	5.4
27 CHARLTON & JOHN H	TRAFFIC SIGNAL	12	7.8
28 HUNTER ST H & JOHN H	TRAFFIC SIGNAL	12	6.6
29 LIMERIDGE RD & UPPER OTTAWA	TRAFFIC SIGNAL	12	5.6
30 LOCKE & MAIN H	TRAFFIC SIGNAL	12	9.6
31 MOHAWK H & UPPER WENTWORTH	TRAFFIC SIGNAL	12	10.8
32 BARTON H & WENTWORTH	TRAFFIC SIGNAL	11	7.4
33 BAY & YORK BL	TRAFFIC SIGNAL	11	7.8
34 CANNON & GAGE	TRAFFIC SIGNAL	11	10.2
35 CANNON & MACNAB H	NB STOP	11	7.8
36 CAROLINE & MAIN H	TRAFFIC SIGNAL	11	5.8
37 CATHARINE & REBECCA	WB STOP	11	6.4
38 FENNELL & GARTH	TRAFFIC SIGNAL	11	12.4
39 GAGE & KING H	TRAFFIC SIGNAL	11	8.0
40 HUGHSON & WILSON H	TRAFFIC SIGNAL	11	4.6
41 BARTON H & MACNAB H	NB STOP	10	7.0
42 BARTON H & PARKDALE	TRAFFIC SIGNAL	10	6.4
43 BURLINGTON & WENTWORTH	TRAFFIC SIGNAL	10	8.0
44 CANNON & KENILWORTH	TRAFFIC SIGNAL	10	8.4
45 CATHARINE & MAIN H	TRAFFIC SIGNAL	10	5.8
46 CENTENNIAL PKWY & SOUTH SERVICE	TRAFFIC SIGNAL	10	3.2

(a) Only collisions occurring within 31 feet (9.5 m) of the intersection are defined as being "in" the intersection and are included in this list.

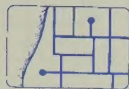
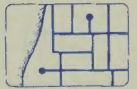


Exhibit 6.3

SIGNALIZED INTERSECTIONS WITH THE HIGHEST COLLISION RATES FROM 1990 TO 1994

INTERSECTION		RL (a)	RC (b)	RL/RC	AVG.3 YR AWDT (c)	NUMBER OF COLLISIONS						5 YR AVG. COMMENTS
						1990	1991	1992	1993	1994		
1	LIMERIDGE RD & GARTH ST	1.75	0.84	2.08	23604	18	8	18	12	16	14.4	
2	CHARLTON AVE & HESS ST	1.73	0.97	1.78	10278	6	8	6	5	6	6.2	
3	KING WILLIAM ST & CATHARINE ST	1.60	1.00	1.60	8592	2	6	4	7	5	4.8	
4	WILSON ST & JOHN ST	1.52	0.84	1.81	23733	10	11	9	20	13	12.6	
5	MOHAWK RD & UPPER OTTAWA ST	1.46	0.80	1.83	32968	18	16	24	22	4	16.8	
6	ABERDEEN AVE & DUNDURN ST	1.37	0.82	1.67	26688	11	14	12	15	12	12.8	
7	YORK BLVD & HESS ST	1.17	0.85	1.38	22492	10	16	6	6	8	9.2	
8	CANNON ST & GAGE AVE	1.17	0.83	1.40	25017	17	4	6	13	11	10.2	
9	BARTON ST & JOHN ST	1.10	0.90	1.22	16181	6	8	3	10	4	6.2	
10	KING ST & DUNDURN ST	1.08	0.75	1.43	46780	16	14	20	16	22	17.6	
11	CANNON ST & HUGHSON ST	1.07	0.88	1.22	18146	7	2	3	6	16	6.8	
12	LIMERIDGE RD & UPPER GAGE AVE	1.04	0.80	1.30	32479	10	8	14	14	13	11.8	
13	HUNTER ST & CAROLINE ST	1.03	1.02	1.02	7749	1	3	4	2	4	2.8	
14	MAIN ST & PARKDALE AVE	1.03	0.85	1.21	21607	9	4	7	14	5	7.8	
15	BARTON ST & GAGE AVE	1.00	0.78	1.27	36143	6	9	12	21	15	12.6	
16	QUEENSDALE AVE & UPPER GAGE AVE	1.00	0.86	1.16	20688	8	3	8	7	10	7.2	
17	BRANT ST & BIRCH AVE	0.98	1.07	0.92	5824	2	2	2	2	2	2.0	
18	CANNON ST & JOHN ST	0.98	0.84	1.17	23908	4	4	11	9	13	8.2	
19	MAIN ST & JOHN ST	0.98	0.77	1.27	40852	29	7	8	12	14	14.0	
20	BRAMPTON ST & WOODWARD AVE	0.97	0.93	1.05	13525	7	6	4	1	5	4.6	
21	CANNON ST & JAMES ST	0.97	0.81	1.20	29531	11	9	7	9	14	10.0	
22	HUNTER ST & HESS ST	0.96	0.99	0.96	8977	2	3	6	1	3	3.0	
23	FENNELL AVE & GARTH ST	0.96	0.78	1.22	37118	12	18	12	9	11	12.4	
24	BURLINGTON ST & WENTWORTH ST	0.95	0.84	1.13	24082	6	10	7	7	10	8.0	



INTERSECTION	RL (a)	RC (b)	RL/RC	AVG.3 YR AWDT (c)	NUMBER OF COLLISIONS					5 YR AVG. COMMENTS
					1990	1991	1992	1993	1994	
25 MAIN ST & DUNDURN ST	0.95	0.73	1.30	59110	17	26	14	24	17	19.6
26 LIMERIDGE RD & UPPER WENTWORTH	0.95	0.82	1.15	26605	12	5	6	16	5	8.8
27 QUEENSTON RD & NASH RD	0.94	0.78	1.22	38754	8	10	17	20	9	12.8
28 MAIN ST & BAY ST	0.94	0.75	1.25	46742	15	16	16	15	15	15.4 (g)
29 BARTON ST & BIRCH AVE	0.94	0.85	1.11	22542	10	5	8	7	7	7.4
30 BARTON ST & BAY ST	0.90	0.94	0.95	12128	5	3	4	4	3	3.8
31 YORK BLVD & LOCKE ST	0.88	0.77	1.13	39148	16	10	13	6	15	12.0
32 BARTON ST & WENTWORTH ST	0.87	0.84	1.04	24226	7	6	7	6	11	7.4
33 HADELAND AVE & UPPER PARADISE RD	0.87	0.93	0.94	13103	99	99	99	4	4	4.0
34 KING ST & GREEN RD	0.86	0.94	0.91	12032	3	1	5	4	5	3.6
35 CHARLTON AVE & QUEEN ST	0.85	0.86	0.99	20170	7	9	7	4	3	6.0
36 WILSON ST & VICTORIA AVE	0.84	0.84	1.01	24453	10	8	4	4	10	7.2
37 FENNEL AVE & CLARENDON AVE	0.84	0.92	0.92	14307	7	3	4	3	4	4.2
38 KENTLEY DR & NASH RD	0.83	0.91	0.92	15141	8	6	2	3	3	4.4
39 CHARLTON AVE & SHERMAN ACCESS	0.82	0.84	0.97	23004	7	11	7	4	4	6.6
40 WILSON ST & CATHERINE ST	0.82	0.88	0.93	18177	5	4	4	7	6	5.2
41 ABERDEEN AVE & LONGWOOD RD	0.81	0.84	0.96	23228	9	4	8	6	6	6.6
42 KING ST & CAROLINE ST	0.81	0.79	1.02	34663	12	8	7	16	6	9.8
43 BARTON ST & MARY ST	0.81	0.88	0.91	17753	6	6	5	7	1	5.0
44 KING ST & GAGE AVE	0.81	0.81	0.99	28423	7	9	4	9	11	8.0
45 CANNON ST & KENILWORTH AVE	0.80	0.81	0.99	29973	9	9	4	10	10	8.4
46 BURLINGTON ST & GAGE AVE	0.79	0.86	0.93	20891	6	12	5	3	3	5.8
47 LIMERIDGE RD & WEST 5th ST	0.79	0.85	0.93	21630	4	5	5	9	7	6.0
48 WILSON ST & HUGHSON ST	0.79	0.89	0.88	16725	0	2	2	8	11	4.6
49 KING ST & OTTAWA ST	0.78	0.88	0.88	18412	6	3	2	11	3	5.0
50 MAIN ST & VICTORIA AVE	0.77	0.76	1.02	45115	9	9	10	20	13	12.2
OVERALL STAT. FOR ALL SIGNAL INTERSECTIONS:				0.50						4.6

NUMBER OF HAMILTON - WENTWORTH TRAFFIC SIGNAL INTERSECTIONS IN 1994 = 344



Notes:

- (a) RL is the number of collisions, per million vehicles entering the intersection, occurring within 31 feet of an individual intersection.
- (b) RC is a volume-adjusted critical rate. If RL exceeds RC (ie. RL/RC is greater than 1.0), one can state with 95 percent confidence that the collision rate at the intersection in question is significantly higher than would normally be expected.

$$RC = Ra + K(\text{the square root of: } (Ra/m)) - (0.5/m)$$

Where: Ra = systemwide average collision rate for all traffic signal locations (0.496 collisions per million vehicle entries)

K = constant (= 1.65 for 95 % confidence level)

m = vehicle exposure at the location in million vehicles entering per year (AWDTx349.6/1,000,000)

- (c) AWDT – Average Weekday Daily Traffic (total vehicles entering the intersection).
- (d) Reconstructed in 1993 to provide channelized left turn lanes.
- (e) Intersection provided with physical barriers to discourage illegal northbound movements in "must turn lane" in 1991.
- (f) Left turn lane painted in 1990.
- (g) Temporary delineation to discourage illegal movements installed in 1991. Permanent installation placed in 1993.

Exhibit 6.4

TWO-WAY STOP INTERSECTIONS WITH THE HIGHEST COLLISION RATES FROM 1990 TO 1994

	INTERSECTION	RL (a)	RC (b)	RL/RC	AVG.3 YR AWDT (c)	NUMBER OF COLLISIONS					5 YR AVG. COMMENTS
						1990	1991	1992	1993	1994	
1	PARK ST & VINE	4.30	1.07	4.01	3859	8	5	6	7	3	5.80
2	BARTON & MCNAB	3.24	0.95	3.41	9006	17	5	11	8	10	10.20
3	FERGUSON & JACKSON	3.00	1.10	2.73	3053	3	5	3	4	1	3.20
4	CATHARINE & JACKSON	2.03	0.95	2.12	8754	9	4	4	6	8	6.20
5	PARK ST & SYDNHAM	2.00	0.99	2.01	6882	4	4	3	7	6	4.80
6	MAIN & PARKSIDE	1.78	1.04	1.72	5151	1	2	6	3	4	3.20
7	HUGHSON ST & REBECCA	1.70	1.04	1.63	5061	4	2	0	4	5	3.00
8	HUGHSON ST & JACKSON	1.60	1.04	1.54	5014	2	3	2	5	2	2.80
9	CAROLINE & CHARLTON	1.58	0.94	1.68	9391	1	4	8	9	4	5.20
10	HUNTER & WALNUT	1.39	0.97	1.43	7799	4	2	6	3	4	3.80
11	CANNON & MCNAB	1.10	0.82	1.33	20370	8	5	5	10	11	7.80
12	FOREST AVE & HUGHSON ST	1.06	1.04	1.02	4850	3	0	1	5	0	1.80
13	PARKSIDE & HAMILTON	1.02	0.92	1.12	11164	6	3	6	4	1	4.00
14	BARNESDALE & CANNON	0.95	0.87	1.09	15045	7	5	4	6	3	5.00
15	HUGHSON ST & YOUNG ST	0.90	0.98	0.92	7646	3	3	3	1	2	2.40
16	BARTON & HUGHSON	0.87	0.88	1.00	14411	4	5	7	4	2	4.40
17	KING ST & WEST AVE	0.81	0.80	1.01	24139	6	7	6	5	10	6.80
18	GLEN ECHO & NASH	0.79	0.84	0.94	18153	7	3	99	99	99	5.00
19	BARTON & DEWITT RD.	0.72	0.86	0.83	15961	4	2	6	99	99	4.00
20	BALSAM & CANNON	0.69	0.85	0.80	16695	7	2	2	5	4	4.00
21	MEADOWBROOK & WILSON	0.64	0.97	0.66	8012	0	0	3	2	4	1.80
22	CAROLINE & HERKIMER	0.64	0.90	0.71	12488	4	4	0	1	5	2.80
23	GOLFLINKS & LEGEND	0.63	1.08	0.58	3653	0	0	0	1	3	0.80
24	GARTH & SANATORIUM RD.	0.60	0.83	0.72	19035	5	2	5	5	3	4.00

(e)
(e)



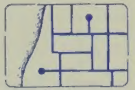


1994 Hamilton-Wentworth Collision Report

INTERSECTION	RL (a)	RC (b)	RL/RC	AVG.3 YR AWDT (c)	NUMBER OF COLLISIONS					5 YR AVG. COMMENTS
					1990	1991	1992	1993	1994	
25 MILLEN AVE & SEAMAN AVE	0.59	1.04	0.56	4853	3	0	0	0	99	(e)
26 FIDDLERS GREEN RD & JERSEYVILLE RD	0.57	0.99	0.58	6965	0	0	0	4	3	1.40
27 BRUCEDALE AVE & UPPER SHERMAN	0.57	0.83	0.68	19233	7	2	3	7	0	3.80
28 RIDGEMOUNT & STONE CHURCH	0.56	0.89	0.63	13243	3	1	3	4	2	2.60
29 CHARLTON AVE & HUGHSON ST	0.56	0.95	0.59	9241	2	0	0	3	4	1.80
30 BARTON & SMITH/STMATTHEWS	0.54	0.86	0.63	15825	4	0	3	6	2	3.00
31 KING ST & PAISLEY	0.54	0.88	0.61	13770	4	1	3	4	1	2.60
32 HERKIMER & MACNAB	0.53	0.91	0.59	11806	2	1	3	4	1	2.20
33 MARKLAND ST & QUEEN ST	0.53	0.83	0.63	19543	6	2	2	6	2	3.60
34 NEBO & WHITECHURCH	0.51	1.09	0.47	3361	0	1	1	0	1	0.60
35 MUD & PRITCHARD	0.51	0.81	0.63	22493	5	1	5	4	5	4.00
36 BERKO & UPPER SHERMAN	0.50	0.89	0.56	12899	5	2	2	0	99	2.25
37 BURLINGTON & HILLYARD	0.49	0.79	0.61	25482	6	4	3	99	99	4.33
38 CANNON & FERGUSON	0.47	0.83	0.56	19629	5	3	5	2	1	3.20
39 KING ST & PARADISE	0.46	0.81	0.56	22584	2	0	2	6	8	3.60
40 DUNDURN & HERKIMER	0.46	0.93	0.49	10044	3	2	2	1	0	1.60
41 BRUCEDALE AVE & UPPER WENTWORTH	0.44	0.89	0.50	12875	2	2	3	2	1	2.00
42 CAMPBELL & OTTAWA	0.44	0.88	0.50	14273	3	4	1	2	1	2.20
43 HADELAND & UPPER PARADISE	0.44	0.89	0.49	13103	0	4	2	99	99	2.00
44 AUGUSTA ST & HUGHSON ST	0.42	1.07	0.39	4073	0	1	0	1	1	0.60
45 AUGUSTA ST & JOHN ST	0.41	0.80	0.52	24959	1	3	7	3	4	3.60
46 UPPER WENTWORTH & VICKERS	0.41	0.85	0.48	16725	1	3	1	3	4	2.40
47 CROCKETTE & UPPER GAGE	0.40	0.86	0.47	15675	1	2	5	2	1	2.20
48 RYMAL & WEST 5TH	0.39	0.80	0.49	24208	4	1	5	99	99	3.33
49 MILES & RYMAL	0.39	0.81	0.49	23242	2	3	1	6	4	3.20
50 SOUTH BEND & UPPER WELLINGTON	0.39	0.85	0.46	17586	4	3	1	2	2	2.40

OVERALL STATISTICS FOR INTERSECTIONS: 0.47 2.0

NUMBER OF HAMILTON - WENTWORTH 2 WAY - STOP INTERSECTIONS WITH TRAFFIC VOLUME IN 1994 = 136



Notes:

- (a) RL is the number of collisions, per million vehicles entering the intersection, occurring within 31 feet of an individual intersection.
- (b) RC is a volume-adjusted critical rate. If RL exceeds RC (ie. RL/RC is greater than 1.0), one can state with 95 percent confidence that the collision rate at the intersection in question is significantly higher than would normally be expected.

$$RC = Ra + K(\text{the square root of: } (Ra/m)) - (0.5/m)$$

Where: Ra = systemwide average collision rate for all 2-way stop locations (0.470 collisions per million vehicle entries)

K = constant (= 1.65 for 95 % confidence level)

m = vehicle exposure at the location in million vehicles entering per year (AWDTx349.6/1,000,000)

(c) AWDT - Average Weekday Daily Traffic (total vehicles entering the intersection).

(d) Converted to All-Way Stop.

(e) Converted to Traffic Signal.

(f) To be signalized in 1995.

(g) Pedestrian Priority Signal location.



Exhibit 6.5

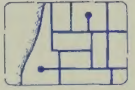
**ALLWAY-STOP INTERSECTIONS WITH THE HIGHEST COLLISION RATES
FROM 1990 TO 1994**

INTERSECTION	RL (a)	RC (b)	RL/RC	AVG. 3 YR AWDT (c)	NUMBER OF COLLISIONS					5 YR AVG. COMMENTS
					1990	1991	1992	1993	1994	
1 HUGHSON ST & KING WILLIAM ST	2.03	1.01	2.00	3524	99	99	99	3	2	2.5
2 STONE CHURCH & UPPER SHERMAN	0.72	0.82	0.87	14365	6	4	4	2	2	3.6
3 MOHAWK & UPPER KENILWORTH	0.71	0.88	0.81	9646	1	5	1	2	3	2.4
4 STONE CHURCH & UPPER WELLINGTON	0.52	0.80	0.64	16634	0	6	99	99	99	3.0
5 STONE CHURCH & UPPER PARADISE	0.50	0.80	0.62	17279	1	5	99	99	99	3.0
6 GREENHILL & QUIGLEY	0.37	0.89	0.41	9390	1	2	0	0	3	1.2
7 GOLFLINKS & MCNIVEN	0.30	0.92	0.33	7560	0	1	1	2	0	0.8
8 JACKSON ST & MACNAB ST	0.28	0.95	0.30	6092	0	1	0	2	0	0.6
9 LIMERIDGE & UPPER KENILWORTH	0.25	0.86	0.29	11576	1	0	0	1	3	1.0
10 STONE CHURCH & WEST 5TH	0.24	0.81	0.30	15933	1	0	3	99	99	1.3
11 CUMBERLAND AVE & SANFORD AVE	0.20	0.90	0.22	8458	0	2	0	1	0	0.6
12 STONE CHURCH & UPPER WENTWORTH	0.15	0.78	0.19	19295	1	99	99	99	99	1.0
13 DELAWANA & LAKE	0.14	0.85	0.16	12324	1	0	0	1	1	0.6
14 SCENIC DR & UPPER PARADISE	0.11	0.87	0.12	10719	1	0	0	0	1	0.4
15 BURLINGTON ST & JAMES	0.06	0.88	0.06	10065	0	0	0	1	0	0.2

OVERALL STATISTICS FOR INTERSECTIONS: 0.44

1.5

NUMBER OF HAMILTON - WENTWORTH ALL-WAY STOP INTERSECTIONS WITH TRAFFIC VOLUME IN 1994 = 15



Notes:

- (a) RL is the number of collisions, per million vehicles entering the intersection, occurring within 31 feet of an individual intersection.
 - (b) RC is a volume-adjusted critical rate. If RL exceeds RC (ie. RL/RC is greater than 1.0), one can state with 95 percent confidence that the collision rate at the intersection in question is significantly higher than would normally be expected.
- $$RC = Ra + K(\text{the square root of: } (Ra/m)) - (0.5/m)$$
- Where: Ra = systemwide average collision rate for all all-way stop locations (0.437 collisions per million vehicle entries)
- K = constant (= 1.65 for 95 % confidence level)
- m = vehicle exposure at the location in million vehicles entering per year (AWDTx349.6/1,000,000)
- (c) AWDT - Average Weekday Daily Traffic (total vehicles entering the intersection).
 - (d) Converted to Traffic Signal.
 - (e) To be signalized in 1995.

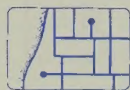


Exhibit 6.6

URBAN ROAD SECTIONS WITH THE HIGHEST COLLISION RATES FROM 1990 TO 1994 ALL INTERSECTIONS INCLUDED

ARTERIAL STREET	From	To	Number of Collisions	RL	RC	Ratio	Link (Km)	Volume (AWDT)	Million Veh - Km/Yr
1 DALEWOOD AV	KING H	MAIN H	10	20.00	8.76	2.28	0.220	1313	0.10
2 JAMES ST H	BARTON H	MURRAY	20	16.67	8.11	2.06	0.120	5786	0.24
3 CANNON	GAGE	OTTAWA	145	14.36	5.70	2.52	0.866	6688	2.02
4 QUEENSTON H	NASH	REGIONAL LIMITS	198	12.30	5.33	2.31	0.823	11175	3.22
5 MAIN H	OTTAWA	KENILWORTH	208	10.27	5.17	1.99	0.836	13845	4.05
6 CHARLTON	JAMES ST H	JOHN H	35	9.33	6.71	1.39	0.244	8840	0.75
7 CANNON	SHERMAN AV	GAGE	120	9.30	5.49	1.69	0.891	8278	2.58
8 JAMES ST H	KING N BRANCH	BARTON H	132	9.10	5.40	1.69	0.860	9634	2.90
9 KING H	QUEEN H	JAMES ST H	295	8.98	4.87	1.84	0.860	21842	6.57
10 BAY	KING H	CANNON	68	8.89	5.95	1.49	0.450	9702	1.53
11 CHARLTON	QUEEN H	JAMES ST H	90	8.70	5.68	1.53	0.823	7211	2.07
12 BARTON H	GAGE	OTTAWA	245	8.46	4.94	1.71	0.860	19256	5.79
13 YORK BL	QUEEN H	JAMES ST H	186	8.38	5.11	1.64	0.921	13784	4.44
14 KING H	GAGE	MAIN H	117	8.27	5.42	1.53	0.610	13281	2.83
15 JOHN H	ST JOSEPHS	KING N BRANCH	219	8.22	4.99	1.65	0.976	15613	5.33
16 CANNON	OTTAWA	BARTON H	114	8.20	5.44	1.51	1.190	6688	2.78
17 JOHN H	KING H	BARTON H	121	8.12	5.38	1.51	0.872	9768	2.98
18 JAMES ST H	ST JOSEPHS	KING N BRANCH	227	8.09	4.96	1.63	0.968	16578	5.61
19 BARTON H	JAMES ST H	WELLINGTON H	163	7.58	5.13	1.48	0.836	14711	4.30
20 BARTON H	QUEEN H	JAMES ST H	110	7.21	5.37	1.34	0.872	10004	3.05
21 MAIN H	JAMES ST H	WELLINGTON H	296	7.18	4.76	1.51	0.866	27208	8.24
22 MAIN H	KENILWORTH	BERRY AV	215	7.07	4.92	1.44	0.702	24768	6.08
23 BARTON H	WENTWORTH	SHERMAN AV	194	7.03	4.97	1.41	0.842	18755	5.52
24 BARTON H	WELLINGTON H	WENTWORTH	186	7.01	4.99	1.40	0.872	17414	5.31
25 KING H	WELLINGTON H	WENTWORTH	263	7.00	4.80	1.46	0.866	24800	7.51
OVERALL STATISTICS FOR ALL ARTERIAL STREETS:									3.71

URBAN ROAD SECTIONS WITH THE HIGHEST COLLISION RATES FROM 1990 TO 1994 SIGNALIZED INTERSECTIONS NOT INCLUDED

	ARTERIAL STREET	From	To	Number of Collisions	RL	RC	Ratio	Link Volume (Km)	Link Volume (AWDT)	Million Veh - Km/Yr
1	DALEWOOD AV	KING H	MAIN H	7	14.00	4.77	2.94	0.220	1313	0.10
2	JAMES ST H	BARTON H	MURRAY	13	10.83	4.98	2.17	0.120	5786	0.24
3	CANNON	GAGE	OTTAWA	76	7.52	3.59	2.09	0.866	6688	2.02
4	QUEENSTON H	NASH	REGIONAL LIMITS	109	6.77	3.33	2.03	0.823	11175	3.22
5	JAMES ST H	MURRAY	BURLINGTON	63	6.40	3.61	1.77	0.890	6336	1.97
6	MAIN H	OTTAWA	KENILWORTH	129	6.37	3.22	1.98	0.836	13845	4.05
7	STINSON ST	VICTORIA AV H	WENTWORTH	32	6.15	4.03	1.53	0.665	4473	1.04
8	CHARLTON	JAMES ST H	JOHN H	23	6.13	4.26	1.44	0.244	8840	0.75
9	CANNON	SHERMAN AV	GAGE	79	6.12	3.45	1.77	0.891	8278	2.58
10	BARTON H	GAGE	OTTAWA	176	6.08	3.06	1.99	0.860	19256	5.79
11	MAIN H	KENILWORTH	BERRY AV	166	5.46	3.04	1.80	0.705	24768	6.08
12	BARTON H	QUEEN H	JAMES ST H	81	5.31	3.36	1.58	0.872	10004	3.05
13	CHARLTON	QUEEN H	JAMES ST H	55	5.31	3.58	1.48	0.823	7211	2.07
14	CANNON	OTTAWA	BARONS	72	5.18	3.41	1.52	1.190	6688	2.78
15	ARKLEDUN	JOLLEY CUT	JOHN H	61	5.17	3.50	1.48	0.400	16892	2.36
16	KING H	GAGE	MAIN H	73	5.16	3.40	1.52	0.610	13281	2.83
17	KENILWORTH	KENILWORTH ACCESS	MAIN H	120	4.94	3.13	1.58	0.695	19991	4.86
18	LIMERIDGE RD	UPPER WENTWORTH	UPPER SHERMAN	110	4.87	3.16	1.54	0.808	15992	4.52
19	WEST 5TH	RYMAL	STONE CHURCH	15	4.76	4.39	1.08	1.021	1769	0.63
20	KING H	WELLINGTON H	WENTWORTH	175	4.66	2.95	1.58	0.866	24800	7.51
21	WENTWORTH	BARTON H	BURLINGTON	43	4.65	3.64	1.28	1.031	5134	1.85
22	BAY	KING H	CANNON	35	4.58	3.76	1.22	0.450	9702	1.53
23	BARTON H	WELLINGTON H	WENTWORTH	121	4.56	3.09	1.48	0.872	17414	5.31
24	KING H	QUEEN H	JAMES ST H	149	4.54	3.00	1.51	0.860	21842	6.57
25	BARTON H	JAMES ST H	WELLINGTON H	94	4.37	3.19	1.37	0.836	14711	4.30

OVERALL STATISTICS FOR ALL ARTERIAL STREETS:

2.14



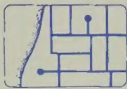
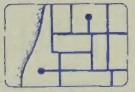


Exhibit 6.8

URBAN ROAD SECTIONS WITH THE HIGHEST COLLISION RATES FROM 1990 TO 1994 INTERSECTIONS NOT INCLUDED

	ARTERIAL STREET	From	To	Number of Collisions	RL	RC	Ratio	Link Volume (Km)	Volume (AWDT)	Million Veh - Km/Yr
1	QUEENSTON H	NASH	REGIONAL LIMITS	99	6.15	2.30	2.67	0.823	11175	3.22
2	JAMES ST H	BARTON H	MURRAY	6	5.00	3.25	1.54	0.120	5786	0.24
3	LIMERIDGE RD	UPPER WENTWORTH	UPPER SHERMAN	107	4.73	2.18	2.17	0.808	15992	4.52
4	KING H	QUEEN H	JAMES ST H	149	4.54	2.06	2.20	0.860	21842	6.57
5	ARKLEDUM	JOLLEY CUT	JOHN H	52	4.41	2.43	1.81	0.400	16892	2.36
6	KENILWORTH	KENILWORTH ACCESS	MAIN H	86	3.54	2.16	1.64	0.695	19991	4.86
7	JAMES ST H	KING N BRANCH	BARTON H	48	3.31	2.35	1.41	0.860	9634	2.90
8	MOUNTAIN BROW BL	MOHAWK H	LIMERIDGE RD	31	3.28	2.53	1.30	1.220	4430	1.89
9	BARTON H	GAGE	OTTAWA	94	3.25	2.10	1.55	0.860	19256	5.79
10	CHARLTON	JAMES ST H	JOHN H	12	3.20	2.95	1.08	0.244	8840	0.75
11	MAIN H	OTTAWA	KENILWORTH	64	3.16	2.22	1.42	0.836	13845	4.05
12	MAIN H	PARADISE	DUNDURN	98	3.09	2.07	1.49	0.907	20024	6.35
13	YORK BL	QUEEN H	JAMES ST H	68	3.06	2.19	1.40	0.921	13784	4.44
14	UPPER JAMES	LIMERIDGE RD	MOHAWK H	139	2.89	1.95	1.48	1.049	26199	9.61
15	ST JOSEPHS	JAMES ST H	JOHN H	22	2.89	2.62	1.10	0.256	16970	1.52
16	CANNON	GAGE	OTTAWA	29	2.87	2.50	1.15	0.866	6688	2.02
17	GAGE	LAWRENCE RD	KING H	29	2.84	2.49	1.14	0.982	5938	2.04
18	BAY	KING H	CANNON	21	2.75	2.62	1.05	0.450	9702	1.53
19	BARTON H	JAMES ST H	WELLINGTON H	58	2.70	2.20	1.23	0.836	14711	4.30
20	BURLINGTON	PARKDALE	WOODWARD H	57	2.61	2.19	1.19	0.927	13470	4.37
21	BARTON H	WELLINGTON H	WENTWORTH	69	2.60	2.13	1.22	0.872	17414	5.31
22	KING H	WELLINGTON H	WENTWORTH	97	2.58	2.02	1.28	0.866	24800	7.51
23	WENTWORTH	DELAWARE	KING H	18	2.54	2.65	0.96	0.500	8122	1.42
24	CHARLTON	WELLINGTON H	WENTWORTH	48	2.51	2.24	0.96	0.854	12835	3.83
25	MAIN H	JAMES ST H	WELLINGTON H	103	2.50	1.99	1.26	0.866	27208	8.24
OVERALL STATISTICS FOR ALL ARTERIAL STREETS:										1.38



Notes: Collision Rates on Roadway Sections

1. Exhibit 6.6 includes all collisions on arterial roadway sections. If the roadway section ends at an intersection, signalized or unsignalized, one – half the number of collisions occurring at the intersection is included.
2. Exhibit 6.7 includes all collisions on arterial roadway sections excluding those which occur within nine metres of a signalized intersection. If the roadway section ends at an unsignalized intersection, one – half the number of collisions occurring at the intersection is included.
3. Exhibit 6.8 includes only collisions on arterial roadway sections which occur greater than nine metres from any intersection. That is, no collisions referenced to an intersection, signalized or unsignalized, are included.
4. RL is the collision rate for the roadway section expressed as collisions per million vehicle kilometres travelled per annum.
5. RC is a volume – adjusted critical rate. If RL exceeds RC (ie. RL/RC is greater than 1.0), one can state with 95 percent confidence that the collision rate at the intersection in question is significantly higher than would normally be expected.

$$RC = Ra + K(\text{the square root of: } (Ra/m)) - (0.5/m)$$

Where: Ra = systemwide average collision rate for all roadway sections:

- 3.71 collisions per million vehicle kilometres in 1990 – 1994 for Exhibit 6.6;
- 2.14 collisions per million vehicle kilometres in 1990 – 1994 for Exhibit 6.7;
- 1.38 collisions per million vehicle kilometres in 1990 – 1994 for Exhibit 6.8.

K = constant (= 1.65 for 95 % confidence level)

m = vehicle exposure for the individual roadway section in million vehicle kilometres per year (AWDT x Section Length x 349.6/1,000,000)

6. AWDT – Average Weekday Daily Traffic

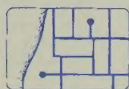


Exhibit 6.9

1994 COLLISION STATISTICS – SELECTED CANADIAN CITIES

CITY OR REGIONAL MUNICIPALITY	POPULATION	PROPERTY DAMAGE ONLY COLLISION REPORTING LEVEL	COLLISION REPORTING CRITERIA (1)				TOTAL COLLISIONS	COLLISIONS /1000 POPULATION	INJURY COLLISIONS /1000 POPULATION		
			(a)	(b)	(c)	(d)				Other	
CITIES											
HAMILTON	319,281	700	N	N	Y	Y	f	5,698	17.8	1,713	5.4
BURLINGTON (1991)	129,500	700	Y	Y	Y	Y	e, f	1,593	12.3	570	4.4
CALGARY	738,184	1000	N	N	N	Y	e, f	26,291	35.6	2,729	3.7
EDMONTON	632,000	1000	N	N	N	Y		18,534	29.3	4,755	7.5
GUELPH (1991)	87,000	700	Y	Y	Y	Y	e, f	1,334	15.3	398	4.6
HALIFAX	114,455	500	Y	Y	Y	Y		4,136	36.1	713	6.2
LONDON (1993)	316,000	700	Y	Y	Y	Y		7,960	25.2	3,001	9.5
MONTREAL	1,019,000	500	N	N	N	Y	g	27,869	27.3	5,234	4.9
MISSISSAUGA	513,800	700	N	N	N	Y		5,334	10.6	955	2.1
REGINA	179,178	1000	N	N	N	Y	f	5,751	32.1	1,568	8.8
ST. CATHARINES (1991)	129,300	700	Y	Y	Y	Y	f	1,891	14.6	386	3.0
SASKATOON	195,500	1000	N	N	N	Y	f	6,246	31.9	1,102 (3)	5.6
METRO TORONTO(1991)	2,187,000	1000	Y	Y	Y	Y	e, f	53,029	24.2	18,624 (3)	8.5
VANCOUVER	508,814	1000	N	N	N	Y	f	18,618	36.6	4,841	9.5
WINDSOR (1993)	191,000	1000	Y	Y	Y	Y		5,903	30.9	1,326	6.9
WINNIPEG	633,747	1000	Y	Y	Y	Y	f	16,777	26.5	6,056	9.6

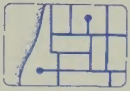
CITY OR REGIONAL MUNICIPALITY	POPULATION	PROPERTY DAMAGE ONLY COLLISION REPORTING LEVEL	COLLISION REPORTING CRITERIA (1)			TOTAL	COLLISIONS /1000		INJURY COLLISIONS	
			(a)	(b)	(c) (d)		POPULATION		POPULATION	
					Other					
<u>REGIONS</u>										
REGIONAL HAMILTON - WENTWORTH (4)	459,656	\$700	N	N	Y Y	f	7,233	15.7	2,205	4.8
REGION OF HALTON (6)	323,200	700	N	N	Y Y		5,410	16.7	917	2.8
REGIONAL OTTAWA-CARLTON	707,750	700	Y	Y	Y Y	f	16,018	22.6	4,032	5.7
REGIONAL MUNICIPALITY OF PEEL (5) (1993)	784,500	700	N	N	N Y	e	3,229	4.1	770	1.0
REGIONAL WATERLOO (1991)	389,817	700	Y	Y	Y Y	f	9,471	24.3	1,421	3.6
REGIONAL MUNICIPALITY OF NIAGARA	393,720 (1991)	700	Y	Y	Y Y	f	5,362	13.6	1,194	3.0

(1) KEY TO CRITERIA FOR REPORTING COLLISIONS (See next page for definitions of injury collisions)

It is generally assumed, unless otherwise noted, that only collisions occurring on public roadways involving personal injury or property damage greater than the reporting level are included on this table.

- (a) Collisions reported involving an infraction of the Provincial Highway Traffic Act with property damage only and less than reporting level.
- (b) Collisions reported involving an infraction of the Criminal Code of Canada with property damage only and less than reporting level.
- (c) Hit and run collisions reported with property damage only and less than reporting level.
- (d) Collisions reported if it involves any personal injury.
- (e) Public property damage collisions.
- (f) Collisions involving City or Regional government vehicles.

- (2) Only injuries requiring medical attention were classified as injury collisions.
- (3) Injury collisions do not include fatal accidents.
- (4) Not including Kings Highways.
- (5) Regional municipality statistics are for Regional roads only and do not include Burlington, in the case of Halton, or Mississauga, in the case of Peel. Thus, the collision rates stated will substantially underrepresent the actual rates.
- (6) Regional Municipality of Halton statistics are for ALL road, for ALL municipalities, within Halton Region as provided by Halton Region Police.



DEFINITIONS OF "PERSONAL INJURY" (a)

Regional Hamilton-Wentworth	- any bodily harm, visible or complained of, that results from a motor vehicle collision.
City of Hamilton	- any bodily harm, visible or complained of, that results from a motor vehicle collision.
Burlington	- any bodily harm, visible or complained of, that results from a motor vehicle collision.
Calgary	- any type of injury resulting from a collision.
Edmonton	- including minor abrasions and bruises, complaint of pain, caused by a motor vehicle collision.
Guelph	- any bodily harm, visible or complained of, that results from a motor vehicle collision.
Halifax	- injury or death (no stipulation regarding severity of injury) caused by a motor vehicle collision.
London	- any type of injury, visible or complained of, caused by a collision; need not be treated at a hospital.
Mississauga	- N/A
Metro Toronto	- injury must be reported when an injury occurs to any of the involved persons in a collision.
Montreal	- any injury, apparent or not, to any person, caused directly or indirectly, by a motor vehicle.
Regina	- any bodily harm, visible or complaint of, caused by the accident.
St. Catharines	- any type of injury resulting from a collision.
Saskatoon	- any bodily harm, visible or complaint of, caused by the accident.
Vancouver	- N/A
Windsor	- any injury resulting from a motor vehicle collision.
Winnipeg	- readily identifiable injury or perceived injury caused by a collision.



- | | |
|----------------------------------|--|
| Region of Halton | - any bodily harm, visible or complaint of, that results from a motor vehicle collision. |
| Regional Municipality of Niagara | - any type of injury resulting from a collision. |
| Regional Ottawa-Carleton | - injury is any bodily harm, visible or complained of, caused by a motor vehicle collision. |
| Region of Peel | - any bodily harm, visible or complaint of, that results from a motor vehicle collision. |
| Regional Waterloo | - injury or death (no stipulation regarding severity of injury) caused by a motor vehicle collision. |

(a) Definitions of a "personal injury" such that a collision involving a personal injury must be reported.

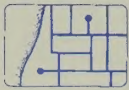


Exhibit 6.10

FATAL COLLISION STATISTICS (a)
NORTH AMERICAN CITIES

(Population 350,000 - 500,000)

CITY	FATALITIES 1993	RATE PER 100,000 POPULATION	RATE PER 10,000 REGISTERED VEHICLES
Hamilton, Ont. (b)	16	3.5	0.5
Buffalo, N.Y.(1989)	18	5.0	0.6
Baton Rouge, La.	20	5.3	0.6
Minneapolis, Minn.	20	5.5	0.3
Wichita, Kans.	21	5.5	0.7
Omaha, Neb.(1989)	24	6.5	0.8
Cincinnati, Ohio	24	6.6	0.4
Virginia Beach, Va.	29	7.0	1.1
Seattle, Wash.(1989)	34	7.0	0.7
Long Beach, Calif.	31	7.1	0.9
Pittsburgh, Pa.	29	7.9	0.6
Charlotte, N.C.	35	8.4	1.0
Sacramento, Ca	33	8.6	0.7
Denver, Colo.	43	8.9	0.7
Indianapolis, Ind.	34	9.2	0.5
Austin, Tex.	46	9.3	1.1
AVG. OF CITIES REPORTING		10.2	1.1
St. Louis, Mo.	41	10.7	0.6
Albuquerque, N.M.	46	11.5	1.1
Oakland, Cal.	44	11.8	2.0
Tucson, Ariz.	52	12.5	1.2
New Orleans, La.	62	12.7	2.4
Toledo, Ohio (1989)	45	12.8	1.6
Oklahoma City, Okla.	69	15.2	1.5
Kansas City, Mo.	72	16.7	2.1
Atlanta, Ga.	72	18.2	1.4
Nashville, Tn.(1989)	105	21.2	4.5
Miami, Fla.	78	21.3	0.8

COMPARED TO THE 27 NORTH AMERICAN CITIES REPORTING HAVING POPULATIONS IN THE RANGE 350,000-500,000, HAMILTON HAS THE NINTH LOWEST RATE OF FATAL COLLISIONS BASED ON POPULATION. THE RATE IS ABOUT TWO-THIRDS OF THE REPORTED AVERAGE.

(a) SOURCE:

Accident Facts, 1994 Edition,

National Safety Council, 1121 Spring Lake Drive, Itasca, Illinois

(b) Rate is for City of Hamilton only.

Appendix

APPENDIX A.1

INITIAL IMPACT TYPES AS DESCRIBED IN EXHIBIT 2.6

FIELD #45 MOTOR VEHICLE COLLISION REPORTING SYSTEM

Initial Impact Type Diagram	Rear End	Head On	Side Swipe	Side Swipe	Overtaking	Right Turn
Code Value	21	22	23	24	25	26
Short Name#	REAREND	HEADON	SDSWPOP	SDSWPSM	OVERTAK	RTRREND

Right Turn	Left Turn	Left Turn	Left Turn	Intersection 90°	Right Turn	Right Turn
27	28	29	30	31	32	33
RTONCOM	LTONCOM	LTRREND	LTOPTH	RTANGLE	RTSDSWP	THR/RT

Left Turn	Left Turn	Single Motor Vehicle (SMV) Strikes Unattended Vehicle	Single Motor Vehicle (SMV) Other	Pedestrian / Vehicle	Left Turn / Right Turn	Other
34	35	36	37	38	39	98
LTSDSWP	THR/LT	SMVPARK	SMVOTHR	VEH/PED	LTRTSWP	OTHER

HAMILTON PUBLIC LIBRARY



3 2022 21335344 0